

Aviation Week & Space Technology

September 10, 1962

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Publication



International Air Transport

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This new titanium wheel will outlast ordinary aircraft wheels at least 5 to 1

This revolutionary titanium wheel by Goodyear is the most durable ever built. To date, it has rolled up a service life of over 14,000 miles in tortuous dynamometer tests—and it's still going strong. This compares with 2000 to 3000 miles of roll life for ordinary aircraft wheels. • And the new wheel has other advantages: 1. High strength-to-weight ratio cuts many pounds off high performance military aircraft. 2. Permits thinner wheel sections—allows more space for brake assemblies. Can be made 15-20% lighter than today's air transport wheels. 3. Increases safety factors. 4. Low thermal conductivity helps tires run cooler. 5. Exceptional anticorrosion properties eliminate the need for painting, make inspections easier and cut maintenance costs. • If you'd like to know more about this aircraft wheel—or other new products for the aerospace age—from the largest, most experienced engineering staff in the business—write Goodyear, Aviation Products, Dept. 4-1714, Akron 16, Ohio.

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First Supersonic Navy Trainer Is Carrier Capable!

The newest addition to the long series of Chance Vought Crusaders now sets with the first as a two place trainer with an expensive but all "real deal" capabilities.

- It gives the Navy its first supersonic trainer with complete carrier capability.
- It doubles as a completely fighting aircraft.
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- And it's immediately available for active duty!

The new-place Crusader, with its pulse streamer (even jockey streamer, give them the breakable experience of flying streamer streamer with an experienced hand aboard. No longer no show streamer, but a real streamer, it's the first in the series.

Because both airplanes have full flight streamer and pulse streamer, two pilots can radar flight from a single beam.

And the new Chance Vought Crusader trainer has loads of the family (based) the first—supersonic streamer streamer with complete ground-support and repair equipment already on board. They'll be glad to welcome this supersonic two seater aboard.

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Sept. 18-19—Electricity Industries Assn. Fall Convention, Baltimore Hotel, New York, N. Y., including Convention and Control Marketing Panel, Sept. 17.

Sept. 19-20—IEEE Fall Meeting, UNAF, New York, N. Y.

Sept. 19-20—Fighter Weapons Meet., Las Vegas

Sept. 19-20—Hydraulic & Air Cautions V-Jet Meeting, Institute of the Aeronautics, New York, N. Y.

Sept. 19-20—Ordnance Environmental Research Symposium, El Trapiendo Hotel, San Antonio, Tex. Speaker: Edward Weisler, Director, Office of Environmental Control, Defense Agency for Souderton Research Institute

Sept. 19-20—12th National Convention & Aeronautics Fairness, Air Force Assn., Las Vegas, Nev.

Sept. 19-20—Trachsel-Manninger Uniflex Meet. Meeting, Institute of the Aeronautics Sciences, Hotel Commodore, New York

Sept. 19-20—Control Systems, M.I.T., Cambridge, Mass.

Sept. 19-20—Control Systems, M.I.T., Cambridge, Mass.

ANILKUMAR MITTAL and Susan Tarkenton

September 18, 1963

Wed. PM. No. 10

substance, land improvements and change of address to Baltimore, Md.; and the fact that the defendant was a member of the Baltimore chapter of the Black Panther Party, which was a subchapter of the Black Panther Party, Inc., a national organization.

After a detailed analysis of congestion patterns by the technical and operational experts of Sweden and Norway, SELENIA radars were chosen. SELENIA ATCR-2 dual-channel air traffic control radars are to be installed at Stockholm (Bromma) and Oslo (Fornebu) airports. These radars are ideally suited for coping with today's traffic problems. Close-range area control radars detection of excessive jet aircraft. Close-in approach and departure control involves high data-rate and extremely high target visibility within heavy fused radar clutter. The SELENIA radar solves both requirements. Can the ATCR-2 help with poor air traffic control problems as it will in these countries?

 **INDUSTRIE ELETTRONICHE ASSOCIATE** 8 p. A
ESTATE DI SAN MOON COMPANY S.p.A. Milano - Via Tiburtina 104/106



Adapted from page 91.

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RELIABILITY BY DESIGN



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Model 20



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Virtual assets considerably high performance levels in its collaboration instruments through use of proved existing and quality components. And most important you can depend on our well-proved engineering capabilities to help solve your most existing measurement problems. Virtualizing requirements. For detailed technical information, contact us at info@vms.com.

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MUSCLES
FOR
P104G

The leading and trailing edge units for the Lockheed F-1040, actuated by Servo systems, were originally used for landing and taxi only. When they were used for microphone and antenna extension, the units had to be jacked into the structure from underneath. Cerco designed a mechanical disconnect that automatically disengages the motor from the driving actuator above ground level, prevents over-heating of the motor clutch. An additional feature, if one motor of a leading or trailing edge unit fails, the other automatically takes over and drives both actuators. For the F-1040, Cerco delivers optimum muscle, torque, and control as required.



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Page: 10/10
Page: 10/10
Page: 10/10

Estimated Landing:

Normal Landing:	1000	100	100	100
In-Flight Maneuvering:	1000	100	100	100
Max. Landing:	1000	100	100	100

Estimated Landing:

Normal Landing:	1000	100	100	100
In-Flight Maneuvering:	1000	100	100	100
Max. Landing:	1000	100	100	100

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Limit *Wrightian*, *Wright* (1971), p. 2, and *Wright* and *Wright*.

[illegible]5-1794 *Asplenium* *Asplenium*—T. J. Allen, Ed. 1974

Figure 3. *in situ* hybridization results for *Brachymeria* spp. in the midgut of *A. gossypiella*.

Example 1 (continued) $\mathbf{A} = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ 3 & 4 & 5 \end{bmatrix}$, $\mathbf{B} = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ 3 & 4 & 5 \end{bmatrix}$, $\mathbf{C} = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ 3 & 4 & 5 \end{bmatrix}$

Operating assets: 100% common stock owned by
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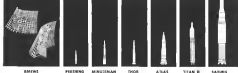
Authors' disclosures of potential conflicts of interest and author contributions are found at the end of this article.

Book: *Chomsky on the Limits of Language* by Noam Chomsky, 1965, MIT Press, 196 pp., \$12.50.

g. available at a fixed total price (about 1.2 euro) at different locations (e.g. in a shop, with delivery time, in pharmacies, etc.)



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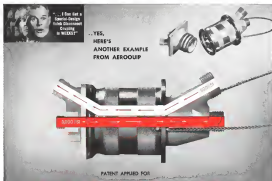
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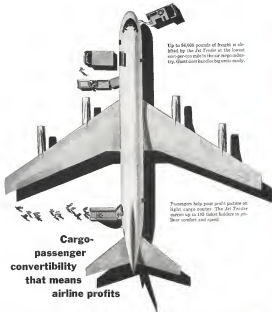
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The Jet Trader will enter service for Trans-Canada Air Lines and TAI in 1963.

New DC-8F "Jet Trader" by Douglas



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APPLICATIONS circuit devices resulting from Motorola's broad range of jointly funded contracts with each of the three services, JPL/NASA, and other government agencies. The independent programs, such as those, employing the frontier processing techniques of diffusion, epitaxial growth, electronic ceramic and thin films to practical electronic hardware applications, we can offer immediate opportunities in both systems and equipment design engineers experienced in the following areas.

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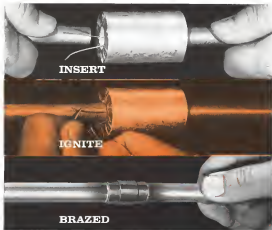
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EDITORIAL

Farnborough's Vintage Year

This was Farnborough's long-awaited vintage year and it was a good one. There was good weather, for at least the first half of the week-long show. Seven new prototype aircraft retained technical substance to the flying display. The development pot was looking in new, powerful advances and the exhibits whose foreign guests are wooed and charmed by the British manufacturers, expanded to new heights of significance.

However, the British industry has been through some tough times and still sees some hard bumps ahead as it fights on a double-fronted home against government policies that look to recognize the true national value of seeking all-round technology lead, and abroad against still foreign competition that has captured many export places in what used to be dominantly British markets. Although the confidence of the British industry is on the rise and at high in the value of its base, new technical developments stand out, it has a far more sober and realistic assessment of its future prospects than in the early Fifties when it transported that Britain leads the world in the air.

The 1962 Society of British Aircraft Constructors' show indicates that Britain does indeed lead the world in some significant aircraft developments and has bright prospects in others if their early promise is supported by a sound government policy and aggressive sales and service efforts abroad.

P.1127 Standout

The most significant performance at Farnborough this year was certainly the most hotly contested performance of the Hawker P.1127 with its Bristol Siddeley Pegasus vectored thrust exemplar. The combined technical genius of Dr Stanley Hooker and Sir Sydney Cowell has produced a truly practical and extremely simple solution to the VTOL problem that should provide enormous benefits for the industry as provider of the Western world both in a tactical strike aircraft and in transport applications. But here again the failure of governments of the Western channel to push this concept as far as possible into a new phase of development will cost more in the long run than any calculating of current development costs in dollars, pounds, francs, lire or marks.

The governments of Britain, the United States and Canada have supported this potent growth through its early development phase. It would indeed be tragic should they later lose what the operational payoff is so close at hand.

British engine development for VTOL performance is still building its early promise in both the vectored thrust approach of Bristol Siddeley and the pure lift engine of Rolls-Royce. Here again these developments will be a unique value in the technical spectrum of the Western world.

In the transport field, the most promising developments spread their shadow across the field at Farnborough with this showing as solid substance was. Then are:

- British Aircraft Corp. BAC 111, short-haul jet transport which has already been bought by five airlines including two U.S. customers; presently on both in the capabilities of Sir George Edwards' old Vickers Armstrong design team at Weybridge and the ingenuity and service support of the Vickers-Rolls-Royce team as demonstrated in the Viscount's history.

- Joint British-French super-jet transport program which

will reach a critical point of decision in a few weeks. Then, has been too much technical effort expended on both sides of the Channel in extensive design and engine development than is generally stated. Technically the Anglo-French team is ready to see the prize of the world's super-jet transport market and there definitely is one. They await only the decision and funds from their governments to go.

Another promising transport development is the de Havilland DH-125 bi-jet executive transport which has been given a good push by its initial Royal Air Force order. With a \$100,000 price tag for U.S. sales and modest prospects in its operational characteristics, it could be an extremely strong competitor for the fast-developing market.

British Aircraft Corp. VC10 and de Havilland Trident center main new technical advances in jet transport design but their sales future does not appear unduly bright perhaps because they have been designed too rigidly to BOMC and BEA specifications rather than broad, unopinioned compromise for the world airline markets in three classes.

After two more years of passionate arguments (many wish to discuss the pre-spatial atmosphere in the U.S.) Britain appears to be ready for the first major step into space with serious study of a manned orbital space vehicle capable of controlled and sustainable operation.

No exhibition of a Farnborough air show would be complete without a tribute to the superb flying display by military test pilots and civilian service teams. In good technical years and on hot, the quality and dash of the British pilots has always remained at a peak. Perhaps nowhere else in the world has it ever been possible to see flying skill demonstrated to the degree that has become the standard Farnborough fare.

This year the Blue Diamonds of 92 Squadron RAF did their 16-phase Hawker Phantom aerobatics with a precision and select swiftness that will stir many, again, with the former phantoms of Tropic One Squadron, the reputation of this technique. Eighty-four of 74 Squadron were in rehearsal with their double-barreled attack in 100-knot, 90-deg climbs and formation aerobatics in March 2 flights.

British Pilot Performance

Ever since we have observed Farnborough, beginning in 1959, both Kenneth of English Electric and Bill Redford of Hawker Aircraft have been stars of the show display. In 1962, they were still at it. Kenneth ended the Lightning around in the dark in 40 tight turns within the perimeter of the airfield. Redford exhibited the struts and precision with which the P.1127 can be maneuvered through an unobtainable angle from a backward climb at 24 kts to absolutely motionless hovering and flat maneuvering around 900 gals. Initially with hovering over a fixed spot.

The British aircraft industry despite of renewed technical vitality at Farnborough this year. But it will take a government policy that fully recognizes the long-term economic value and national security of pushing its industrial growth into the most advanced technology in a safe competition with other nations if this promise is to be fully realized.

—Robert Hutz



ALL-WEATHER HU2K-1

Around the clock rescue helicopter operation is now a reality with the U.S. Navy. In fair weather or foul when aircraft are launched from a carrier, the pilots can be sure that the "Seasprite" will be on station to provide a helping hand should they encounter emergency ditching. The automatic self-contained navigation equipment allows the HU2K-1 to operate on its own away from its ship whether it be carrier, cruiser, or destroyer. The HU2K-1 can home in on downed aircraft or navigate over vast ocean reaches to ships in distress. The eyes of the Navy are even sharper now.



WHO'S WHERE

In the Front Office

J. E. Atwood, chairman, North American Systems, Inc., succeeding the late J. H. Riedelberger. Mr. Atwood continues as president.

Dr. Ward C. Low, vice president research IRT Electronics group of Lubbock, Tex. Electronics, Inc., Boston, Mass.

Manure B. Westphal, general sales manager, has been named regional assistant to the president of Century Air Lines, Inc., Wilkes, L. Minnesota. He has occupied at 400 part-time sales and advertising.

Earl V. Schuchle, secretary-treasurer, Los Angeles Service Inc., a subsidiary of Los Angeles Gas Co., Los Angeles, Calif.
Electrical division vice president: Robert J. Powers, secretary, service division, Charles J. Baker, nature service division, Kenneth E. Miller, service engineering division, Eugene J. Gorman, aircraft and mobile field operations division.

Dr. E. T. Frazee, director of Logistics Central Procurement Equipment Corp., Tarrytown, N. Y. Dr. Frazee continues as vice president logistics for General Procurement Agency, Little Falls, N. J.

Paul H. Williams, vice president Gen. loc. Inc., Los Angeles Calif., to head new product development.

Dr. LeVan Griffin, vice president, South-west Research Institute, San Antonio, Tex., and head of the newly opened Southwest Research Institute-Dallas. The new staff also includes Dr. Herbert C. McKee.

William F. Shaw, Jr., assistant to the chairman Pacific Automotive Corp., Burbank, Republic Aviation Corp., Farmingdale, N. Y., has elected C. E. Reed as vice president manufacturing and, Murray Beckman

Reg. Gen. for T. Holdings, director of Right to Life, U.S. Air Force, Norton AFB, San Bernardino, Calif.

Honors and Elections

Polystar. Aeromarine Internationale will feature the following Americans during the 55th annual conference: U.S. Navy Cmdr. Arment Alan R. Shepard and Marine Lt. Col. R.C. Robinson will receive the **DeLaval Medal** for their established record of altitude world records in speed aircraft and space landings. **Vin Hargrave**, American Free Man Prisoner Medal winner and Ernest Schwesinger, author, designer and creator of the **Paul Tibbets** Diagon in recognition of their work in promoting the peace of the oceans in general, and the **DeLaval Medal** in recognition of **Vin Hargrave** and Ernest Schwesinger, author of *Mr. Captain World* account, his cruise to the **Marshall Islands** in recognition of his battle records the battles.

FNI also will present the DeLaVack Medal to G. M. Mowbray, A. Feltner and Cosmonauts May Yau Guezo and May Guezo Tette of the USSR. Switzerland's A. Schlegel will accept the Livershall Medal for his second already silver cup.

Dr. E. Oteiza, Director General of Economic Affairs, Cuban Ministry of Foreign Affairs, has been elected president of the International Civil Aviation Organization.

INDUSTRY OBSERVER

• **Search grants to maintain NIM**—sewer vehicle—labeled Mark 12—has been awarded to maintain the possibility of detection in order to help settle the creek's streambed. It will be fabricated under a cost-plus contract program in a contractor to be selected by a competitive narrowly being conducted by Air Force Systems Command's Defense Systems Group. Among 16 proposals submitted to attend the recent bidding was Aerojet-General, Azusa; the Defense Division of Ford Motor Co., Ann Arbor, Mich.; General Electric and United Aircraft Corp., Hartford, Conn.; and the Los Angeles area and a third in the Los Angeles area.

▲ Air Force Special Weapons Center, Kirtland AFB, N. M., is conducting procurement of two laser systems, probably as part of its Advanced Research Projects Agency program (AWR-76-3, p. 42) in high-energy devices. Both R&D procurements are for rules-destroyer—i.e., 10-kilojoule output, Keweenaw-modulated laser, the other a high-power device consisting of two laser kinds of the laser chemical cavity type, with a resonator from a ruby crystal. The laser device is to be cooled to liquid nitrogen temperatures.

► Payroll for the "new" News launch vehicle has been raised to a minimum 500,000 lb, as each orbit used 100,000 lb, to ensure

• Ablation experiments to be carried about the Mercury MARS flight will consist of wire grids constructed by gas agglutination. Some of the materials will be purposely designed prior to launch to test effects of space environment on various types of damage and also to assess possible methods of ablation repairs that would be practical in space. The grids will be fitted around the forward driver section of the spacecraft housing the main and reserve recovery parachutes.

• *Parafilm* packages arrived at developing large-area, thin-film solar cells capable of capturing space vehicles with high powerper unit weight: now being negotiated but won't be National Aeronautics and Space Administration with Radio Corp. of America's David Sarnoff Research Center and Chivric Corp.'s Shodorir Transistor Division (AW Mar. 25 p. 55). Ultrathin, thin-film solar cells offer possibility of using solid-conducting a reflector's solar-conversion units to the structure of the powercraft itself.

*Letter has been sent to industry by NASA's Mission Specialist Center detailing the qualifications necessary to compete for the ground operational support system (GOSIS) and the integrated remote control facility, to be used in Gemini and Apollo missions. One qualification will stop most bid-competitors in operating a geographically-dispersed tracking network.

• Group of high intensity electric lamps on the ground at Darwin, South Africa, will implement ground flare test at Woomera, Australia, to extend Mercury visual earth studies in the upcoming MARS ascent flight.

* Aerospace companies selected to supply equipment for the automatic checkout system of the Midea (461) satellite alarm satellite system (AW Proc 25, p. 73) are Avco Inc. (digital computer and associated equipment), East Wright (ground handling and support equipment) and Tridon Electronics, Inc. (audio frequency instrument). Contracts totaling \$3 million were negotiated last week by Lockheed Martin and Sperry Co., which will be responsible for integrating the system for the Air Force.

► **Hand-held camera** photograph equipment in the MAV flight will be refined to produce a 35-mm. robot camera with a single 1/30-second range-zoom, offering Assistant Walter Skidmore of the research team a continuous 180-degree panorama and viewing times. Photo subject matter will also be more specifically targeted than previously, with subjects still along South America's rugged coast and specific weather phenomena. The camera will be useful as such in the accuracy of current satellite mapping resources by providing an additional perspective. The weather patterns will be helpful in development of improved upper level, Ties and March weather satellites.



All Bendix space communications equipment undergoes extensive qualification and acceptance testing to ensure maximum reliability.

ADVANCED SATELLITE REPEATERS are the result of three years of continuing development to improve efficiency, stability, thermal balance, size, and weight. This is one of the many space projects at the Bendix Systems Division, where engineering opportunities exist from initial electronic and space vehicle design through assembly and field operations. Write or call Personnel Director, Bendix Systems Division, Ann Arbor, Michigan—an equal opportunity employer.

Bendix Systems Division



WHERE IDEAS
UNLOCK
THE FUTURE

Space Juggling Act

Washington Roundup

Kennedy Administration continues to juggle the delicate national and international political problem of assuring Congress and the public that the nation has an adequate military space program and ensuring the rest of the world that the U.S. has only peaceful aims in space.

In a speech widely published in advance in the Administration's position, Deputy Defense Secretary Kenneth Gillette said last week that the U.S. has no intention to place any weapons of mass destruction into orbit and that it is "working in every conceivable way" to keep the arms race from spreading into space. He said there is no doubt that either Russia or the U.S. could now place thermonuclear weapons into orbit, but such an action is not part of a national military strategy. In effect, he said, the U.S. is pursuing peaceful exploration of space, both by itself and in cooperation with other nations, and "we will of course take such steps as are necessary to defend ourselves and our allies, if the Soviet Union chooses to do so."

Meanwhile, President Kennedy included Defense Secretary McNamara in the list of officials who will accompany him this week on his "business trip" to Cape Canaveral, Fla., the National Aeronautics and Space Administration complex at Huntsville, Ala., and Houston, Tex., and the McDonnell Aircraft Corp. plant at St. Louis Mo., where the Mercury and Gemini manned capsules are built. Official Vice President Lyndon Johnson, Budget Bureau Director David Bell, NASA Administrator James C. Webb and congressional leaders concerned with the military and civilian space programs.

Kennedy Counterfire

The Kennedy Administration has welcomed the replies of Sen. Robert Kerr and Rep. George Miller, champions of the Senate and House space committees to critics of the military space program. It now appears to be ending their "space inquiries" that the U.S. doesn't launch enough advanced orbiting defense satellites (see p. 14), and to consider the possibility that Russia alone succeeds in its space attempts. Although the U.S. has had considerable information on Russian failures during last five years to Sputnik 1, it has refused to risk its life on the basis that to do so reveals intelligence capability. The Kerr-Miller letter and Webb's reply may be a final balloon to see whether more important criticism on Russia's weapons is worth more than posturing that the nation doesn't know what the Russians know.

First indication that Russia failed in an attempt to send a probe to Venus on Aug. 25 was the result of a day's delay in the launch and did not reflect their "deliberate" policy on postponing Soviet failures. State Department, North American Air Defense Command and NASA spent several days discussing whether and how the failure should be listed in the biweekly satellite situation report issued by NASA. They had not resolved the questions when word of the failure broke on a television network.

Manned Space Stations

Regardless of stated policy, Air Force and military interest in manned, manned space stations is at a new high (see p. 16). Most of the military interest now centers around delivery systems, but that is not the only area of interest. Air Force's Space Systems Division, which had its own satellite systems studies conducted earlier this year (AW Jan. 25, p. 20), is continuing to study studies and encouraging a number of aerospace firms to push studies of their own systems. Companies at present actively engaged in such studies are Lockheed, Hughes Aircraft, Ford, Hughes Aircraft, Martin, Lockheed, McDonnell, Raytheon and Hughes. Weapons explored by SDD or proposed by aerospace firms in recent presentations range from exotic concepts such as orbit lighting (AW Dec. 4, p. 52) and laser radiation weapons (AW May 26, p. 41) to simple ideas for shooting or putting the wrong parts of alien satellites.

New Cuban Weapons

Cuban government of Fidel Castro "will be prevented by whatever means may be necessary from taking action against any part of the Western Hemisphere," in spite of a Russian-led buildup of arms, President Kennedy warned last week. The President said there is now evidence that Russia has provided Cuba with a number of antiaircraft defense missiles with a short range of 25 mi. which are similar to early models of our Nike Hercules and other electronic equipment which is required for their operation. "We will have a new Soviet-made missile battery boats carrying day-to-day guided missiles having a range of 15 mi."

Soviet military technicians now in Cuba on an order total about 3,500, the President said, but "there is no evidence of any organized combat force." From one Soviet bloc country, "or of Soviet military bases or operations, growing beyond the borders of the President said. Earlier the President had said he did not have evidence of anti-missile missiles in Cuba (AW Sept. 3, p. 13).

—Washington Staff



AVRO VULCAN tested for Bristol Siddeley Olympus 305 turbojet engine to be used in Anglo-French supersonic transport and TSR 2.

P.1127 Flight, Transport Displays Dominate

British aviation industry shows some bright spots despite uncertain government policies, design lags.

By Herbert J. Coleman

Farnborough—Display of seven new prototypes at the annual British aircraft industry display here last week sparked optimism for a comeback in the international market for both military and transport aircraft.

Highlight of the show was the light demonstrator out of the Hawker P.1127 vertical-takeoff fighter prototype using vectored thrust from its Bristol Siddeley Pegasus turbojet engine. Two P.1127 prototypes piloted by Bill Bedford and Hugh Messenger demonstrated a flight envelope ranging from horizontal speed of 24 kt. to high subsonic forward speeds and including hovering over a fixed point while maneuvering the aircraft laterally in a full circle.

Foreign observers who were most impressed by the P.1127 performance also saw the first time three new jet transport—first, the Vickers VC.10, the de Havilland Trident and the BAe 146—the Bristol T.115 Mach 2 research aircraft and the Bagley M.210 plane wave engine research plane.

Pressing British civil transport, the BAC 111, was shown in model form, since the first aircraft is being built and will fly in the summer of 1985.

In the face of government design plans to defend most research as supplied by the cancellation of the English Electric, the Vickers and the Vickers Trident, the British industry design teams are pushing hard to fill a gap left when the Seaden White Paper of 1957 cut back the external aircraft programs in favor of missiles. Some of the projects are:

• **British Aircraft Corp.'s** joint program with Sud Aviation to design and build two versions of a Mach 2.2 supersonic transport, powered by the Bristol Siddeley Olympus 305.

• **Proposed to British Air Ministry** by Hawker Siddeley to build a Mach 1.15 replacement for the aging V bomber force. The new bomber would also use a version of the Olympus 305 and could have a civil application. A supersonic version of the Polaris carrier also is in the works.

• **Change in missile program** from large launchers to low speed weapons, such as the Exocet, Skyflash and the Hawk. The Hawk Siddeley CH 390 Shepherd weapon for Royal Navy, and the Short Tigeret, a land-based version of the nuclear Scout missile (AV Aug. 27, p. 31).

• **Hawker T.115**, a follow-on to the

which sold Hawking Jet Provost, featuring a powered nacelle for high altitude flying up to 18,000 ft., and wing leading to accommodate fuel in fuel tank with single point refueling capability. The Hawking H.135 jet flag research plane also has been recently awarded (AV Sept. 3, p. 71).

• **Reserved support** for the TSR 2 low speed reconnaissance aircraft now limited to a possible two orders of 75, or 10 more than originally planned.

• **Inevitable attempt** to craft the Douglas DC-8 replacement market with a de Havilland design: the DH 116, a 25-passenger airplane, powered by the Bristol Siddeley BS75. The airplane has been a design project for a year, but work has lagged due to strong competition from the DC-815 customer jet transport.

• **Hawker P.1127**, a supersonic, multi-engine aircraft of the Hawk family with two Rolls-Royce Spey jet engines being in production in a straight wing.

Reserved pressure on design teams was reflected in this year's Farnborough show by the first public demonstration of the Vickers VC.10, the de Havilland DH 1021 Trident and the DH 115 overture jet.

Star of the show was Britain's only road for world leadership in the VTOL field—the Hawker P.1127 with its Bristol Siddeley RS 53 Pegasus engine. Two airplanes flown by Hawker Aircraft test pilots, Bedford and Messenger, demonstrated all aspects during the demonstration, from high speed level flight to vertical flight at speeds up to 24 kt.



DE HAVILLAND DH-115 is shown in final approach at Farnborough. RAF has ordered 12 of the aircraft, order may eventually reach 75.

Farnborough

The two airplanes in the formation of one being built at Kingston for Coast Britain, the U.S. and West Germany. The airplane, which was designed by the Siddeley Group, will be delivered to the three countries by the spring of 1984. Development test program, at least initially, will be conducted in England.

For Avro 146, competing director of Bristol Siddeley Engines Ltd. and the RS 53 was a running at 12,000 lb thrust and is expected to reach 15,000 lb thrust shortly. At that time, he said, the P.1127 will have performance surpassing that of the Hawker Hunter in all respects.

Next step in development of the Hawker P.1127, the company's entry in the NATO SRRM-1 VTOL competition. The P.1127 will use the RS 53 25,000-lb thrust engine, which features a new chamber burning. The plan chamber project is headed by the U.S. government through several aerospace development allocations, but the rest of the engine currently is a joint venture by the company.

Mazda has been ordered for the prototype RS 53, and metal will be cast soon.

In addition, the Hawker team is designing a two-place version of the P.1127. It also will have value as a trainer despite the fact that the P.1127 has been ordered only by U.S. National Aerospace and Space Administration and Royal Air Force pilots in as little as 15 min.

Kernell is the engine's supplier.



BAGLEY M.210 is featured as a new addition to Bagley line. Its development is Bagley M.210 research engine. Two of the tests have been ordered by Ministry of Aviation.



DE HAVILLAND TRIDENT flies out of its landing at Farnborough, Farnham. Trident is due to roll out of Hatfield this month. Trident is powered by three Rolls-Royce RB165 Spey engines which are fitted with computer-aided variable inlet ramps.

an offshoot of the design history in which Sir Sydney was first offered a powerplant and designed the airframe around it, rather than the familiar reverse practice.

Simple instrumentation

Instrumentation has been kept simple, and a remarkable feature is that instruments from VTOL, hovering to final flight, is achieved by a single control lever. The procedure is to advance the throttle to limit available thrust and lower it full forward. Next, the pilot moves a lever mounted on the throttle quadrant to whatever position he wishes to place his engine modes. Then, can be either full down for idling, or 45 deg. for the takeoff performance. A gage on the panel watches engine pressure. Cockpit mode control lever acti-

vates a chain system to move the four nozzles through 90 deg. Bristol Siddeley is now working out a chain lift.

Sir Arnold and the establishment control system has been fitted to the airplane but has not been tested and is not used.

Test Pilot Hatfield added that response is quick, and that the airplane is flown in the conventional stick-and-rudder manner.

Weapons capabilities of the P 1127 has never been revealed, but the air plane has flares with weights simulating a variety of types from rockets to bombs. It would carry up to 4,000 lb. of weapons. Range of the aircraft is 2,000 mi.

In the Hatfield Meteorite Down experiment, both engines made high-speed passes before the crowd dispersed and

then returned to show hovering characteristics in tandem.

The airplanes were flown backward, climbing at that figure and in 100-deg. turns around the air cars.

In STOL, takeoffs from both surfaced runways and grass, the P 1127 was airborne within 10 yards. The grass showed no signs of erosion after the takeoff or during the hovering demonstration of the aircraft.

Other demonstrations

In other demonstrations, the screaming British aircraft is impressive in a variety of ways. The Bristol T 153 standard model airplane (AW July 3, p. 361), flown in Godfrey Arto to Farnborough from Bournemouth Down experiment, both engines made high-speed passes before the crowd dispersed and



BRISTOL T 153 is highly instrumented to check Mach 2 testing conditions. Aircraft is powered by two de Havilland Gyron Junior engines.



FLATS OF VICKERS VC10 transport are fully extended in preparation for landing roll. New transports were super displays.

ground equipment and integration of its Mach 3 research program.

The other significant research trip-part the Hatfield Page 115 also delta airplane, also performed and was shown in static display. A final research vehicle, the Bristol Type 221 (AW Aug. 6, p. 79), was shown in static form as the British Aircraft Corp. stated.

The model models are rule bookings helps just above and below the sign wing. Lower helps below the landing gear. The aircraft is a tribute of the Farn 102-2 research plane, a project accepted by British government after it had captured the world's speed record.

Woolf's 100, in the supersonic era, was made in an 8000 V-bomber tested carrying the Olympus 593 engine in a twin engine pod being from the belly. The same engine is used in the TSR 2. The same engine is used in the Silver Arrow, which is a variable ramjet on the exhaust outlet.

In the executive and business flying field, the new British system flown at Farnborough were the DH-123 jet and the Bristol M 1215 twin, along with an advanced version of Bristol's 286 twin.

The DH-123 was the first airplane to win an order at Farnborough when Aerco and that the airplane would be purchased for Royal Air Force. The first order is for 21 DH-123s, although the program has been contracted for a 108 plane order. The order is worth about \$10 million to de Havilland.

Powerplant in the Bristol Siddeley Viper 20 turbojet mounted on the tail engine, but this engine also will be offered with the General Electric C2 610 engine. Bristol Siddeley has an option to develop a jet version of the Viper for the DH-123.

The Royal M 1215, designed by a team led by George Niles, has extensive use of glass-reinforced plastic in the nose and upper fuselage sections. The engine is two Rolls-Royce Conquest C 4300 as cooled. But its slender ratio of 145 hp/lb. each.

Peter Musfield, Breghe's managing director and sales efforts will be aimed at the general European market rather than 30 attempt to gain a foothold in the United States, at least in the foreseeable future. The main reason is the cost of establishing sales and service outlets in the U S and Musfield also thinks production limitations will not stretch to include U S sales.

The second M 1215 is due to roll out next month to undergo the certification program. The basic airplane will still be 525,000.

Test showing of the Breghe 2007, production version of the 200K, revealed a larger airplane, a revised cabin for more headroom and a 5-ft stretch to the wing. Selling price is about \$50-800 for the seven-seat version. The only sales since the airplane was sold out in April has been two to the Ministry of Defense for Colombia.

Farnham Breghe designs according to Musfield, will include the three-seat M 117, a single-engine version of the M 718, but this airplane is at least a four-seat version. However, Musfield considers the M 738 a basic design from which an entire family can be evolved. The M 738 has a gross weight of 1,200 lb. and a 18-gal. fuel capacity. Maximum recommended cruise is 175 kph at 1,018 ft. and maximum range with a 100-lb. payload at 10,000 ft. is 1,000 stat. mi.

Military flying was dominated by the

English Electric Lightning of the RAF No. 14 Squadron, flying with Hawke Hunter of No. 92 Squadron in formation. New flag was hoisted to two Blackburn Buccaneers, primarily because of a safety. It currently under way for airplane recently, claimed to be the first Air Arm. The Nylon harness in the aircraft cockpit section has been damaged with dust. Repair consists of blowing them clean before clearance for operational flying.

The Lightning, in a series plan, has been started from the base, however, but that was added a refinement called a "twinkl roll." Aircraft at the test points of the damaged rolled in low while the rest of the formation flew high. Another new demonstration was a two-breaker at low altitude with each airplane towing to a designated heading, and then moving into a vertical climb.

As the planes air-borne, the fall in the display was achieved by high-speed dashes across the airport by M 3 and M 5. Lightnings lifted with damage models of the de Havilland Red Top helicopter, another example, a development of the de Havilland Puma (AW Aug. 27, p. 28).

Scotsman Hunter also working from a base damaged old formation with and low level turns. The road striking air-nerer involved the front rank of the damaged moving into a line-of-flight formation, with the damaged following, and then breaking into a fan.

British various formations were not new during the show. Although West had closed its M 2 version of the SHN 2 in its third. The vehicle is currently being constructed at Isle of Wight.

Interest Grows in British V/STOL Work

The Coil Inspection

Farnborough—U. S. industry's growing interest in Britain's leading position in V/STOL engine and airframe developments and the latter nation's focus on new wings towards quiet were highlights of last week's 23rd annual Farnborough exhibition.

While Britain was displaying concrete evidence of its VTOL advances with the appearance of the transonic Blazer P 1127 in the flying display, at least four potential license agreements between U.S. and British manufacturers were being discussed in the background.

• **Republic and Hawker Siddeley** Aero-Indo representatives were exploring the potential of a joint development and production effort in the field of VTOL fighter aircraft.

Probably first on the agenda would be Republican participation in development of the F117 follow-on, the Mach 2.5 P1158, which the pentagon plans to order for the Royal Air Force as a replacement for the Hawker Hunter combat fighter in the middle of the decade.

A two-place version may be ordered as a Sea Vee replacement for the Royal Navy.

Results suggest that a model for peptide synthesis and production of a third-generation neutral blood lipase using a recombinant variable-region D24 chain, originally derived for the South African AIDS virus, may be feasible. The V201, still in flight. Although ruled out of the NATO competition, the U. S. Defense Department may authorize production of at least two prototypes to determine feasibility and

• **Port & Whitney and Diesel Sidelies** were discussing the possibility of the U.S. Navy gaining licensed production rights for the 32,000-hp diesel BS-30A9 versatile thrust engine used last year to power the P-1154. A \$9,100-lb. diesel engine, the BS-30A9 is a derivative of the BS-30A9 used in the German and Italian and they each planned to support their national projects, and Porter is expected to give a similar reply.

intake, a straight U.S.-co-Brazil V/STOL technological flow. Under the plan, Ling-Temco-Vought would build a plant for Shufu in Northeast India for limited production of the tilt-wing XC-142 (should the turboprop aircraft win the current BMR-4 NATO competition for a medium-range V/STOL transport). The XC-142 already is in an advanced stage of development in the winter of a U.S. interim competition for a V/STOL transport award.

While the BMR-1 program for a common NATO close-support fighter already seems destined to fall apart as each nation goes its own way, some observers here feel that the BMR-4 program has a better chance of success.

Under U.S. pressure the large NATO nations were polled earlier this month in an effort to determine the countries that possibly would shade in a NATO decision in this area. Assistance options were reviewed from Great Britain, Canada and Belgium, enough to avert a wartime production run. Germany and Italy said they each planned to support specific national projects, and France is expected to give a similar reply.

In space, the Parshovsough exhibits largely reflected the bolting Not stop

development now applicable to Europe as a whole. British Aircraft Corp., whose exhibit included a model of the U.S.-designed British Aral satellite now in orbit, reported that it is conducting a detailed design study on a 150 lb satellite payload for examination of the "fringe atmosphere" at altitudes of 100 to 500 mi. Communications satellite designs also are under study by BAC.

Under a Ministry of Aviation contract, BAC also is carrying out a design study for a space chamber test facility to examine possible effects of low temperature and solar radiation on a total life support machine.

The Dental Society display included an actual concept of non-traditional satellite launch vehicle designed around two-in-the-future advanced developments of the company's target populations.

Under the concept, a delta-winged launching vehicle with four large non-its would carry satellites of up to 50 tons at speeds of approximately 8,000 mph to an altitude of 110,000 ft for launch into orbit. Later, the manned launch vehicle would return to base.

Member of Astronaut Julian Aunoy and a feasibility study has started into development of a manned spaceplane, which would take off from a ground station, fly to space and, moreover, then return. BAC is conducting the study under Dr. Burtan Wolfe. Powerplants would be engines designed by Bristol Siddeley Engines.

Frankston-Bennett, a fiber manufacturer and designer and producer of high-tech flight suits, exhibited a one-of-a-kind model of an inflatable space platform made in detail to proposition not forward in the U.S. to Glendale.

The platform, which could be folded into the nose cone of the booster vehicle and automatically inflated once in orbit, would be a double-walled fabric structure in the shape of a spoked wheel with each spoke having a probable diameter of about 0.5 ft.

Designed for habitation by an experimental crew, the platform would include a mass solar energy collector baffle plus another for optical, radio and radar observation, plus a communications collector.

Schematic of a high-altitude magnetic rocket system with a possible launch capability under government contract development was developed by David Auerbach, Ltd. With an overall length of 7.5 ft. and a gross weight of 81 lb., the rocket is designed to carry 10-lb. payloads to altitudes of 30 to 60 m. Burn-out altitude of the solid-propellant motor is 43,000 ft.

An interesting aspect of the course



HAWKIEE P-1127 began transition from vertical to horizontal flight (above). With mouth of Inland Salinity 85 F3 oriented in tilt dog position, as below, aircraft can take off with 25-30 (and beyond) full aiming weapons posture and full fuel load.



is its portable launch system. Basically, the cranes of a 32-ft long launching tube mounted on the rest of a standard three-ton truck chassis. The tube can be raised and lowered by a hydraulic crane.

Competing design philosophies for attention, funding and orders between the VTOL design concepts of Kollsman and Bristol Siddeley show each borrowing a little from the other.

Rolls, the 117 engine project, is quietly developing its potential and features a revised thrust pipe design for an advanced, high-bypass-ratio turbofan engine, while Bristol Siddeley is working towards completion of detail aspects of its 4,000-lb-thrust RS 59 lift fan engine.

The basic philosophy of each version is explained below.

the need for lift augmentation for its vectored-thrust powerplants in the V/STOL. Light engines on large transport aircraft had two vectored-thrust fans, providing an effective means for smaller combat aircraft. Both controls that the pass lift engine alone is sufficient for combat vehicles. Vectored-thrust augmentation may be desirable on the larger transports, according to Luft.

There also appears to be a distinct possibility that the government, by killing off certain projects through lack of funding and supporting others, may effectively designate Roth-Rosen as the sole left-leaning manufacturer and distributor.

Saddlesby is the lone British producer of a convertible, though not one without a top.

The BS 79, for example, has yet to gain endorsement support as a firm outside buyer. Bristol Saddleby plans to complete development work on the 10-litre engine with its own funds by late this year or early 1963 but will accept the program no further unless it is placed orders in sufficient quantity to make production worthwhile.

Midship of a refined development of the RB162 lift engine concept is shown at the Rothstätt Testbank. It is composed of a cylindrical pod housing a horizontally mounted RB16 with two nozzles providing outlets that can be swivelled through a full 180 deg only to automatically provide thrust

Pricing Looms as Key Question for IATA

Infringement of rate standards heads discussion list; Hildred suggests methods of reducing capital costs.

By L. L. Doty

Dublin—International Air Transport Ass'n's 18th Annual General Meeting opened here today as an atmosphere of optimism over traffic growth prospects during the next year but with strong doubts that the industry had found the proper pricing formula to ensure continuance of that growth.

More than 200 top-level airline officials met here at the Library of the Royal Dublin Society during the airline industry's annual period of three- to four-day sojourn from the bitter competitive struggles of the previous year. Jeremiah F. Dempsey, general manager of Air Lingua—last to the airline—provided over today's plenary session as 18th president of IATA.

Principle of today's meeting was a call for a temporary moratorium on the practice of new tariffing by nationalized carriers as a means of curtailing competition by Sir William Hildred, director-general of IATA. In his opening address, Hildred urged the industry to take a "long-term thought about further equipment purchases at least for the time being."

The plea, following as it did Great Britain's first public drying of two new jet transporters at Farnborough last July, will undoubtedly meet much resistance, particularly in view of the fact that manufacturers' representatives have been banned from IATA's annual general meetings for the past two years.

Chief criticism pointed by Hildred as practitioners' action against internal changes was:

- **Recent temptations** to add new service routes in instances where evidence of significant demand exists.
- **Initiation** of a determined effort to develop new traffic, "rather than merely intercepting control loads, when entering any established market."

Hildred was not quite as outspoken in his objection to the development of a supersonic transport as he has been at past meetings, but he did question the wisdom of diverting large sums of money in the project which might be used to greater advantage elsewhere.

In this connection, he voiced the sentiments of Sir Arthur Baskin, chairman of the Hurdell Aircraft, who proposed last week at Farnborough that all-southern landing systems and greater concentration on safety and reliability should take precedence over economics in a supersonic transport program. Reiterated IATA president and chairman of Qantas Airways of Australia, Sir Paul

von Fichtel-Haerle took sharp exception to this trend.

Admitted that the safety and reliability factors were vital to the industry, Fichtel-Haerle said the industry's proposal that the British Foreign Airports Association project be deferred. He said, "No one wants to have the introduction of the supersonic aircraft but absolutely inevitable it will come. The main question is who will build it? Air Great Britain and Europe going to leave it to the U. S. and Russia? Now is the time for decision. It always has not been too long since the possibility of being too late in developing a new type."

Continued issues this year appear to be few with the problem of orderable delivery dates for jet transporters, particularly in the North Atlantic area, among foremost. Pan American World Airways, with the backing of TWA, is the chief center for order pulling and tighter enforcement of IATA rate standards as a means of meeting high volume in the future.

At last year's meeting in Sydney, delegates met several times, when nationalized carriers and tariff agencies were sharply criticized, government interference in IATA enforcement policies could be expected (AW Oct. 30, p. 34). In a letter to Pan American from Civil Aeronautics Board Chairman Alvin S. Boyd, circulated during the Sydney session, foreign flag carriers were specifically charged with violating IATA rate policies.

Although enforcement procedures were discussed, under resolutions adopted in Sydney, enforcement has been slight and the problem is still considered severe by a number of carrier presidents here. Hildred has the means to place the failure to curb rate violators.

"Enforcement action has only scratched the surface. Our staff of two dozen enforcement officers must try to cover a whole world network, with its half billion miles of routes, thousands of selling points, thousands of local representatives back to staff, and thousands of agents. There is a tremendous and optimistic need for more."

Basic fare structures and a renewed drive for lower fares will preoccupy delegates in corridor discussions but the general topic of rates and fares is not likely to be touched on the floor of the closed session at a session of setting a pattern for the IATA traffic conference to follow.

The conference began Sept. 24 in Cheltenham, Ave.

On the other hand, newly adopted group lines on the North Atlantic, which were approved only after a series of mail votes resulted sharp airline differences (AW Feb. 12, p. 38), will be considered, based on a meeting earlier in the closed session of the meeting. High cargo break points in freight ratings will also draw the attention of delegates.

Here is what Hildred had to say to set out the new experimental group fares and cargo rates.

These changes appear to have increased our loads but I would like to be more certain than I am that they have actually increased net revenues in proper proportion. Group fares can be easily discriminatory from normal traffic, and high cargo break points can be a source for loss at the expense of balance sheets. I hope that the freight rate conference will make certain whether we have achieved the right perspective."

IATA carriers are still widely divided over whether fares should be lowered or raised. In several cases, but proposed delegation in the traffic conference from obtaining in their headquarters with any agreement in hand. Proponents of raising the present fare structure, at least until opening costs of jet transporters have been paid off, are absent in their stead.

On the other hand, supporters of low reductions are less confident over their position because of a continuing demand of air-borne traffic, but some are not in a mood of opening new markets but they are hesitant over taking any more that might take a big step out of gain revenue.

Believing for open positions on the IATA, closed executive committee in the short Thursday of this week at the

World Air Transport Growth—1948-1961

	1940	1945	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961
ALL TRAFFIC														
Grp. A	25.0	33.8	33.5	52.2	17.4	14.4	17.7	16.8	14.7	14.6	9.5	17.0	16.6	16.4
Traffic increase	17.6	17.7	39.5	21.5	13.6	12.6	11.6	17.0	19.1	32.6	6.4	10.5	12.7	6.6
Load factor	55.3	55.0	58.2	57.6	60.7	59.6	59.0	59.0	59.3	57.4	55.8	57.0	55.2	55.0
PASSENGER TRAFFIC														
Grp. A	17.2	17.7	30.0	10.4	10.5	17.2	14.7	15.1	14.1	17.7	9.8	11.7	14.2	14.1
Traffic increase	10.5	14.3	39.5	21.5	13.6	12.6	11.6	17.0	19.1	32.6	6.4	10.5	12.7	6.6
Load factor	62.4	59.7	60.5	64.9	63.4	62.0	60.7	62.2	62.7	62.2	58.6	60.1	59.0	55.1

ALL TRAFFIC figures are given in kilometers; passenger traffic figures are in seat kilometers and passenger kilometers.

Shelburne Hall, where after today's preliminary sessions of the meeting will take place. Since the number of countries for committee points for events the number of openings for the first in IATA, London, the committee and main round, category-wise, 5.95, for the year. He said that this is a decline in the growth level of 12.1% recorded in 1960 and the 14.5% in 1959. It is also.

A recent report was held last year's meeting in Sydney for the first time (AW Nov. 28, p. 38) when Richard J. Jackson, director of Standard World Airlines, led a group of dissident airlines in a drive for stronger anti-cartel representation on the executive committee. The move failed in a vote margin.

However, Jackson is expected to launch a similar action this year in hopes of restoring a sufficient number of votes to increase objections to the current high proportion of U. S. carriers on the executive committee in relation to representation of airlines of other nations. Jackson's charges that IATA is dominated by the big sugar cartels is countered by Pan Am and British Overseas Airways Corp., who point to the fact that small carriers are represented by a majority on the committee.

Principal reasons behind the optimism over the future, based on the 16.7% increase in passenger traffic during 1960, an international operations compared with a 2.8% increase in domestic traffic of the world's airlines, according to statistics of the International Civil Aviation Organization.

The rise in international passenger traffic which is substantially less than the 27.0% increase recorded in 1960 and a decline in 1961 of 6 percentage points in load factor is a disconcerting loss in 1961 of 5.7% in operating loss of \$140 million. Based statistics of ICAO show an operating profit for the industry in 1960 of \$70 million, a 1.1% increase over the previous year.

For growth purposes new have been restored that year.

In his report on the state of the industry, Hildred noted that in 1960 the increase of the entire IATA membership from 1959, the executive and main round, category-wise, 5.95, for the year. He said that this is a decline in the growth level of 12.1% recorded in 1960 and the 14.5% in 1959. It is also.

For the year as a whole and the airline as a whole, since the rate of growth in traffic was lower than in any year in the last 15 years, with the exception of 1958, and the load factor had the lowest of all of the airline industry.

Hildred said that domestic traffic continues to dominate the world statistics in its sheer weight and that because of the large volume of traffic handled in domestic, in U. S. carriers, traffic is still within the U. S. have a dramatic, one-third total on world figures. A 10.8% increase in 1960, strikes and "other factors" he said, as reflected in the traffic results of the airline industry and domestic industry.

Hildred showed strong concern over the increase in capacity, particularly in the North Atlantic and pointed to the 17% increase in seating capacity in that area in 1960 compared with a 12% increase in seating capacity elsewhere. He added that a large portion of North Atlantic traffic has in excess flight on that the actual increase in passenger traffic is calculated against seat miles.

Hildred suggested preliminary financial estimates of ICAO for 1961. He said that total operating revenues for the world airlines has been set at \$14 billion and operating expenses at \$15 billion, a net loss of \$1 billion. Based statistics of ICAO show an operating profit for the industry in 1960 of \$70 million, a 1.1% increase over the previous year.

Hildred stated that these figures are not entirely realistic, since they refer only to operating results and do not reflect the net profits after such items as interest, retirement of property and equipment, and investment have been taken into account. He added:

"But as a rough idea, the 1961 net percentage of 2.8 is not a rough estimate and is still subject to revision. The fact remains that the industry as a whole has gone into the red in its operating accounts for the fourth time in ten years, and that the percentage of loss in 1961 was greater than at any time since 1945."

He then said in a statement which is still uncertain he said: "If all the airlines had without exception received the amount of rate increase on the basis of the facts and if the airlines had acted after the pattern of normal carriers versus instead of what they did do, the operating result would have been considerably better."

Hildred called for action in controlling passenger volume changes being made in 1961. He said that latest city statistics indicate that the airline in 1961 paid some \$20 million in new charges, more and above an estimated \$20 billion in new charges, other than passenger fares. He added that a large portion of North Atlantic traffic has in excess flight on that the actual increase in passenger traffic is calculated against seat miles.

On the subject of capacity, Hildred expressed concern over the cost of using capital to acquire and maintain the increased capacity. He said it is no longer as easy a problem to solve as it once was, and that the industry must take steps to ensure that it is not overcapacity. He added that when the capital cost of the airlines becomes prohibitive, and when the airlines find that they are not



Caravelle Horizon Makes First Flight

Caravelle Horizon, 10 A powered by General Electric CF6025C-4 jet engines, made its first flight recently. Horizon differs from other Caravelle configurations in that the wing section has been extended over the wing root by means of a swept back glee, on the leading edge. Fuelage is stored in fuel tanks and persons seated forward of 50 forward-facing passengers. Windows have been selected five higher than on earlier Caravelles. And there are indications of double-ducted fans on the Horizon, used in conjunction with subsonic speeds, provide the aircraft to attain over 5,000 ft per hour. Another Caravelle version powered by Pratt & Whitney JT3D-4 turbines, a designated 30A. No orders have been placed for either, but interest has been expressed by National ALM and Air France.

and want, and current were forced to default their obligations because of a reduced market.

Bladed around the general optimism prevalent here today when he noted that the rate of increase in production capacity is beginning to taper off. Rate of increase, he said was less in 1965 than in 1960 and, since investment forecasts will be declined this year that, there will be no "boom" there last year, the rate should drop in 1967.

He anticipated that a relatively stable capacity position will be reached by 1967.

Added toward a continuing growth in the demand for all types of air services throughout the world. He stated that growth in international traffic had not been as "lumpy" as originally anticipated and added that there is still twice as much potential traffic in the air transport market than has been taken out of it.

He was not as ebullient in his call for lower fares as he has been at previous annual general meetings but he did stress that the principle of low fares is alive, and that if he has in the past, he had considerable at giving more than demanding without thinking.

British May Cancel V/STOL Transport

London—It is doubtful as whether to go ahead with OR.101, the Royal Air Force V/STOL transport program (AVR, No. 1) is 150 probably will be made, says Minister of Defense Peter Cresswell, who has been told with U.S. Defense Secretary Robert McNamara this week in Washington.

Project is being studied with interest, since removal of Short Brothers and Harland and Gloster Whitcomb aircraft are being on the drawing, Short Brothers has submitted an STOL version of its four-engine (jet) prototype, and Gloster Whitcomb has designed the AV-42 around four British-built RS-100 rotary thrust engines.

Other competitors are the Bristol 200, also using four RS-100s, and the BAC-212 (the Lockheed RH-119 prototype) have been transported back under license to British Aircraft Corp.

Speculation here is that the Treasury may scrub the program to divert the \$384 million initial development costs to other projects such as the OR.102 missile reconnaissance fighter, or switch to the BAC-212 in which development funds have already been spent by the U.S. If the latter course was adopted, Short Brothers probably would get part of the initial cost reimbursement.

The present government is believed to be leaning in favor of the Lockheed model which would be built by BAC under license to Lockheed. Income anticipated from research and development could be offset. With the national economy only 14 months away, the government wants a self-help and wants to expend funds in areas that have a direct effect and appeal to constituents.

In addition, England is not anxious to incur costs to build defense projects at the time. If the nation goes the Common Market, it will be required to reduce defense expenditures per capita to a level close to per capita European members of the economic community—a level now substantially lower than England's.

Meanwhile, the RAF feels that there is an urgent need to substitute the two- or three-engine project.

EAL Anticipates Increase in Engineers

New York—Eastern Air Lines officials say that when training is completed for pilots now undergoing instruction for pilot-operations pilot the carrier will have approximately 100 more engineers than it did before the June 75 flight engineers strike.

Eastern and the carrier's parent firm, the pilot-operations already announced plans will bring the total number of engineers to approximately 700. This number will consist of 180 engine flight engineers who returned to work reluctantly, 130 reserve pilot pilots who have already completed operations training and 400 other pilots including those (including) who chose to take engine training after Eastern grounded its Martin jet two-engine fleet.

Eastern said that fewer flight engineers who did not respond to the company's return-to-work offer had been notified that there are no longer in Eastern's engine. Instructions were not sent, that Eastern's program to retrain its reserve pilots now doing courses from the strike would extend up to high management levels. One key figure, described as a pilot in U.S. Marine, was present at a site who resigned last 3. Other changes were expected to be announced following a meeting of Eastern's board of directors Friday.

Eastern also was involved in two court actions brought by the Flight Engineers International Union, in an effort to block the strike recovery. Judge Richard H. Lewis of U.S. District Court for the Southern District of New York, denied the FEIA a preliminary injunction that would prevent Eastern and the Air Line Pilots Ass'n from executing an agreement for the training of pilots to replace flight engineers.

In a similar action, the U.S. Court of Appeals, Second Circuit, in New York affirmed an earlier court decision that Eastern acted within its rights when it initiated action to replace engineers with pilots.

Senate Seeks to Extend Subsidy To Additional Helicopter Airlines

Washington—House and Senate committees within the next few days will decide on what extent the federal government should subsidize helicopter flights in fiscal 1967 (AVR Sept. 3, p. 10).

The final compromise will also give Civil Aeronautics Board guidelines for distributing such subsidies to the future.

Senate committee will pass for an extended subsidy program to extend federal aid to four other than short helicopter lines. Opponents of this approach feel such limited aid will lead to further all helicopter lines on subsidy eventually.

The Senate appropriations committee recommended that CAB helicopter subsidies be limited to \$5,950,000 in fiscal 1967 with no more than 25% of that amount allocable to any one area. The House approved \$4,975,000 and did not limit its distribution by area.

When the appropriations bill reached the Senate this week, Sen. Richard B. Russell (D Ga.) said he proposed the limitations adopted by the committee because he felt it was unfair to limit federal subsidies to three helicopter lines already approved by CAB for such special aid (Chicago Daily News, Los Angeles Herald and New York Herald).

Sen. Russell said that since 1954 those lines have received \$41.7 million in subsidies in what he called "one of the largest expenditures in human his-

try. Either the service ought to be expanded or it ought to be discontinued.

It is difficult to predict any helicopter subsidy, but it is impossible to predict extending over 15 years a subsidy for a purely local service that has no external benefits in the national security or national welfare of the people. We cannot justify conferring it to these three groups.

But Robert C. Cavanaugh, New York Airways president, wrote recent Senate that the Russell amendment would reduce the subsidies to actually that necessary would have to be distributed by both law and the Los Angeles law. He said the CAB said there would not be time in fiscal 1967 to reach the next measure to authorize subsidies to a fourth line service.

The Senate adopted a compromise amendment which would still split the subsidy line was not more than increase the over all amount from \$5,950,000 to \$10 million, that leaving \$5.9 million available for the three carriers already receiving subsidies. The Senate therefore goes to conference in a position to lower the total total figure somewhat without bringing the amount for the three carriers below \$5 million.

The Senate rejected an amendment by Sen. William Proxmire (D Wis.) to eliminate helicopter subsidies altogether. He said people who ride helicopters should not be subsidized by the general taxpayer.

FEIA Claims Photos Show Laxity by Pilots

Washington—Flight Engineers International Union has announced that it has submitted to the Federal Aviation Agency a series of photographs which the union claims show serious violations of air traffic procedures and regulations in several airline pilots during actual flight.

FEIA produced the photographs in compliance with an FAA request which indicated that the pictures could be subpoenaed for confirmation of a recent union charge. Photographs show various pilots asleep at the controls at various periods. One picture shows a window in a stewardess cabin at the controls. FAA requested names of carriers involved, the dates and numbers of the flights and the position of the aircraft when the pictures were taken.

The union said that it would supply the information for each picture. Ron Brown, president of FEIA, said a second set of "more complete" photographs involving "another airline" are also in existence but could not be produced for FAA examination until the photographer agrees to their release.

After those a year ago Aviation News reported the alleged conduct of such pictures (AVR Jan. 16, 1961, p. 15) but the report was denied at that time by FEIA.

Hughes' Affidavit

New York—Hughes Helicopters met only to long, small-scale operations Sept. 24 in the Times World Airlines unit but not agreed here, but TWA began questioning the authenticity of a document in which Hughes purportedly agreed to be approved.

Hughes attorney Charles Davis, New York City, said he was not to accept a subpoena for the document used by the U.S. District Court here on the basis of an affidavit containing a purported Hughes' signature purporting Davis to do so.

But TWA Attorney John Starnett then brought a document purporting to be a signature of Hughes' (AVR Sept. 24) in the court here and the court here noted the signature was not that of Hughes based on comparison with documents in TWA files.

Hughes was given a week to reply to the subpoenaed signature. Hughes' attorneys said that Hughes, under a ruling of the court, was not required to appear while Hughes' attorneys continue to take depositions of witnesses in the case (AVR Sept. 17, 1961). The court judge Melville, representing the document in the opinion, suggested that the TWA attorney accept a subpoena of the deposition taking to facilitate the Hughes appearance.

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	Total General Assets	Investments & Related Changes	Property & Equipment	Total Assets or Value Plus	Total Current Liabilities	Long-Term Debt	Deferred Credits	Shareholder Equity
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INTERNATIONAL JOURNAL OF ENVIRONMENT & DEVELOPMENT

	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012
Amesbury	264,319	18,707	263,294	418,238	107,741	318,341	41,374	120,632
Andover	94,919	3,859	91,724	136,423	15,339	84,795	7,150	39,149
Arden	1,820	242	1,794	2,145	947	1,648	1,048	1,048
Concordville	17,910	1,001	40,432	19,282	16,979	42,008	3,128	10,462
Oran	35,000	3,266	111,420	142,810	31,373	47,432	10,000	33,674
Rollins	38,792	11,328	344,289	242,216	57,194	146,111	4,241	1,829
Weymouth	436	766	1,172	2,582	103	242		
Westford	16,464	13,136	19,267	136,347	22,268	39,120	6,720	20,289
Westford	2,080	1,045	3,145	3,145	3,145	3,145	3,145	3,145
Westford	4,432	6,223	141,704	171,391	37,676	105,617	14,348	50,344
Weymouth	18,916	2,321	18,000	25,278	6,488	33,333	2,880	10,000
Westford	38,478	34,478	344,344	412,344	94,344	254,344	104,344	104,344
Westford	140	119	150	145	189	149		
Westford	2,382	2,381	10,108	25,840	4,802	70,201	140	5,113
Westford	100,412	12,070	218,120	225,752	321	100,412	100,412	100,412
Westford	140,416	7,838	889,388	1,140,388	314,388	1,140,388	1,140,388	1,140,388
Westford	39,348	7,483	81,201	105,272	17,854	32,278	3,311	10,863
Total	763,816	268,999	2,349,120	3,697,146	736,276	3,258,179	149,713	424,344

4. CO_2 -Aq. 20 wt. %

Advertising	6,184	1,283	12,478	19,388	6,290	70,207	120	2,043
Remotes	2,950	840	4,250	10,400	2,448	4,858	071	3,831
Control	2,318	382	1,900	4,540	3,347	1,000	000	000
Graphic	3,830	223	3,117	7,026	3,383	1,487	32	1,716
Letter Control	1,610	880	1,413	7,418	2,609	3,280	1	2,051
Graphic	1,450	644	7,100	11,808	7,418	2,609	3,280	1,450
Black Control	3,347	367	6,708	13,845	6,393	4,213	2	2,334
Graphic	3,802	388	3,208	6,832	3,283	1,470	2	1,798
Graphic	4,814	684	7,760	18,417	8,884	4,748	2	2,748
Footnote	7,251	884	10,967	19,388	6,718	8,208	99	5,681
Leadsman	2,810	200	2,471	6,289	2,946	3,477	1	1,891
Footnote	2,211	2,211	2,211	2,211	2,211	2,211	4	1,847
Wall Street	3,816	373	4,348	8,840	2,974	3,194	2	2,638
Total	50,544	4,664	57,561	130,848	43,644	58,474	479	10,000

MARKS & HANSEN

Alameda-Alameda	9,950	936	6,899	10,900	4,167	5,066	991	933
Alameda-Crested	3,868	256	1,150	2,234	681	149	40	681
Alameda	1,410	203	4,168	1,896	2,000			
Caracas	379	33	1,16	212	270			101
Caracas	1,161	791	3,105	4,643	1,836	2,316	71	1,478
Caracas	107	199	396	194	194			
Mr. C. C. Alameda	1,385	203	3,000	5,773	673	9,990	11	1,309
Mr. C. C. Alameda	2,310	137	2,260	5,237	5,237	5,237		
Mr. C. C. Alameda	3,265	203	3,000	2,774	811	215	1	1,687
W. C. Alameda	11	16	44	980	18	44	1	113
W. C. Alameda	1,818	1,715	1,715	1,715	1,715	1,715		
Total	576,100	51,108	346,422	576,100	17,200	264,200	106	55,200

1. *Journal of the American Medical Association*, 1997; 277: 1001-1005.

Calgary	1,321	64	710	2,037	604	1	37	1,540
Los Angeles	867	126	3,330	4,644	863	3,314	48	1,183
New York	1,814	740	2,899	5,355	1,921	1,154	391	2,193

Table 1

[illegible]

Key Words: child abuse; child sexual abuse; child sexual exploitation

Industry Note The U.S. Department of Energy has announced that it will be releasing information on the results of its investigation into the cause of the explosion at the Fukushima Daiichi nuclear power plant. The release is expected to occur in the next few weeks.

Airline Revenues, Expenses—First Six Months, 1962

Die in der Tabelle aufgeführten Werte sind die Ergebnisse der

	OPERATING REVENUES					Total Operating Expense	Operating Profit (or Loss)	Net Profit (or Loss)
	Passenger	A & M	Mail	Freight	Other			
COMMERCIAL TRAINS								
All lines	59,559	5,577		15,874	124,128	191,040	6,003	3,470
Rocky Mt.	39,095	1,364		7,793	41,711	58,316	2,407	1,124
Consolidated	7,782	779		1,886	30,417	39,865	1,723	376
Delos	54,274	1,820		3,163	92,890	150,313	11,767	4,079
East line	140,275	2,741		6,641	150,589	161,042	19,000	15,000
Rocky Mts.	41,453	9,173		10,173	81,744	142,441	1,003	1,003
Washington	34,420	269		1,201	26,324	29,120	(2,976)	(1,470)
Rocky Mts.	42,176	1,378		3,163	47,500	63,174	1,474	1,474
East line	107,748	2,363		10,008	140,119	160,240	18,116	18,116
Grand Totals	245,134	9,183		30,263	372,361	477,514	(1,072)	(1,240)
Western	135,163	663		1,701	27,344	33,468	6,767	1,855
Total	1,437,446	26,884		57,294	1,426,476	1,461,095	(23,762)	(8,333)

INTERNATIONAL

Canada	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	2101	2102	2103	2104	2105	2106	2107	2108	2109	2110	2111	2112	2113	2114	2115	2116	2117	2118	2119	2120	2121	2122	2123	2124	2125	2126	2127	2128	2129	2130	2131	2132	2133	2134	2135	2136	2137	2138	2139	2140	2141	2142	2143	2144	2145	2146	2147	2148	2149	2150	2151	2152	2153	2154	2155	2156	2157	2158	2159	2160	2161	2162	2163	2164	2165	2166	2167	2168	2169	2170	2171	2172	2173	2174	2175	2176	2177	2178	2179	2180	2181	2182	2183	2184	2185	2186	2187	2188	2189	2190	2191	2192	2193	2194	2195	2196	2197	2198	2199	2200	2201	2202	2203	2204	2205	2206	2207	2208	2209	2210	2211	2212	2213	2214	2215	2216	2217	2218	2219	2220	2221	2222	2223	2224	2225	2226	2227	2228	2229	2230	2231	2232	2233	2234	2235	2236	2237	2238	2239	2240	2241	2242	2243	2244	2245	2246	2247	2248	2249	2250	2251	2252	2253	2254	2255	2256	2257	2258	2259	2260	2261	2262	2263	2264	2265	2266	2267	2268	2269	2270	2271	2272	2273	2274	2275	2276	2277	2278	2279	2280	2281	2282	2283	2284	2285	2286	2287	2288	2289	2290	2291	2292	2293	2294	2295	2296	2297	2298	2299	2300	2301	2302	2303	2304	2305	2306	2307	2308	2309	2310	2311	2312	2313	2314	2315	2316	2317	2318	2319	2320	2321	2322	2323	2324	2325	2326	2327	2328	2329	2330	2331	2332	2333	2334	2335	2336	2337	2338	2339	2340	2341	2342	2343	2344	2345	2346	2347	2348	2349	2350	2351	2352	2353	2354	2355	2356	2357	2358	2359	2360	2361	2362	2363	2364	2365	2366	2367	2368	2369	2370	2371	2372	2373	2374	2375	2376	2377	2378	2379	2380	2381	2382	2383	2384	2385	2386	2387	2388	2389	2390	2391	2392	2393	2394	2395	2396	2397	2398	2399	2400	2401	2402	2403	2404	2405	2406	2407	2408	2409	2410	2411	2412	2413	2414	2415	2416	2417	2418	2419	2420	2421	2422	2423	2424	2425	2426	2427	2428	2429	2430	2431	2432	2433	2434	2435	2436	2437	2438	2439	2440	2441	2442	2443	2444	2445	2446	2447	2448	2449	2450	2451	2452	2453	2454	2455	2456	2457	2458	2459	2460	2461	2462	2463	2464	2465	2466	2467	2468	2469	2470	2471	2472	2473	2474	2475	2476	2477	2478	2479	2480	2481	2482	2483	2484	2485	2486	2487	2488	2489	2490	2491	2492	2493	2494	2495	2496	2497	2498	2499	2500	2501	2502	2503	2504	2505	2506	2507	2508	2509	2510	2511	2512	2513	2514	2515	2516	2517	2518	2519	2520	2521	2522	2523	2524	2525	2526	2527	2528	2529	2530	2531	2532	2533	2534	2535	2536	2537	2538	2539	2540	2541	2542	2543	2544	2545	2546	2547	2548	2549	2550	2551	2552	2553	2554	2555	2556	2557	2558	2559	2560	2561	2562	2563	2564	2565	2566	2567	2568	2569	2570	2571	2572	2573	2574	2575	2576	2577	2578	2579	2580	2581	2582	2583	2584	2585	2586	2587	2588	2589	2590	2591	2592	2593	2594	2595	2596	2597	2598	2599	2600	2601	2602	2603	2604	2605	2606	2607	2608	2609	2610	2611	2612	2613	2614	2615	2616	2617	2618	2619	2620	2621	2622	2623	2624	2625	2626	2627	2628	2629	2630	2631	2632	2633	2634	2635	2636	2637	2638	2639	2640	2641	2642	2643	2644	2645	2646	2647	2648	2649	2650	2651	2652	2653	2654	2655	2656	2657	2658	2659	2660	2661	2662	2663	2664	2665	2666	2667	2668	2669	2670	2671	2672	2673	2674	2675	2676	2677	2678	2679	2680	2681	2682	2683	2684	2685	2686	2687	2688	2689	2690	2691	2692	2693	2694	2695	2696	2697	2698	2699	2700	2701	2702	2703	2704	2705	2706	2707	2708	2709	2710	2711	2712	2713	2714	2715	2716	2717	2718	2719	2720	2721	2722	2723	2724	2725	2726	2727	2728	2729	2730	2731	2732	2733	2734	2735	2736	2737	2738	2739	2740	2741	2742	2743	2744	2745	2746	2747	2748	2749	2750	2751	2752	2753	2754	2755	2756	2757	2758	2759	2760	2761	2762	2763	2764	2765	2766	2767	2768	2769	2770	2771	2772	2773	2774	2775	2776	2777	2778	2779	2780	2781	2782	2783	2784	2785	2786	2787	2788	2789	2790	2791	2792	2793	2794	2795	2796	2797	2798	2799	2800	2801	2802	2803	2804	2805	2806	2807	2808	2809	2810	2811	2812	2813	2814	2815	2816	2817	2818	2819	2820	2821	2822	2823	2824	2825	2826	2827	2828	2829	2830	2831	2832	2833	2834	2835	2836	2837	2838	2839	2840	2841	2842	2843	2844	2845	2846	2847	2848	2849	2850	2851	2852	2853	2854	2855	2856	2857	2858	2859	2860	2861	2862	2863	2864	2865	2866	2867	2868	2869	2870	2871	2872	2873	2874	2875	2876	2877	2878	2879	2880	2881	2882	2883	2884	2885	2886	2887	2888	2889	2890	2891	2892	2893	2894	2895	2896	2897	2898	2899	2900	2901	2902	2903	2904	2905	2906	2907	2908	2909	2910	2911	2912	2913	2914	2915	2916	2917	2918	2919	2920	2921	2922	2923	2924	2925	2926	2927	2928	2929	2930	2931	2932	2933	2934	2935	2936	2937	2938	2939	2940	2941	2942	2943	2944	2945	2946	2947	2948	2949	2950	2951	2952	2953	2954	2955	2956	2957	2958	2959	2960	2961	2962	2963	2964	2965	2966	2967	2968	2969	2970	2971	2972	2973	2974	2975	2976	2977	2978	2979	2980	2981	2982	2983	2984	2985	2986	2987	2988	2989	2990	2991	2992	2993	2994	2995	2996	2997	2998	2999	3000
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LOCAL SERVICE	7,000	142	8,373	289	10,139	10,332	295	249
Telephone	3,297	23	3,282	161	3,340	4,108	783	293
Post Office	1,026	133	1,159	227	1,387	1,418	231	143
Busstop	6,073	81	6,154	26	6,180	7,725	105	76
Inter-City	1,026	133	1,159	227	1,387	1,418	231	143
Mailboxes	7,190	141	7,330	481	11,210	13,472	444	191
Waste Removal	7,190	230	6,967	107	10,245	10,970	488	101
Police	6,433	81	6,514	146	6,660	9,163	315	80
Fire	1,152	133	1,285	227	1,512	1,544	32	115
Sanitation	3,683	107	2,446	269	6,326	3,874	178	127
Tram System	5,149	81	2,466	246	8,328	7,800	187	116
Water	1,298	133	1,431	227	1,658	1,688	30	115
Total	49,434	1,316	50,641	4,209	67,246	71,800	3,476	3,445

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	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	2101	2102	2103	2104	2105	2106	2107	2108	2109	2110	2111	2112	2113	2114	2115	2116	2117	2118	2119	2120	2121	2122	2123	2124	2125	2126	2127	2128	2129	2130	2131	2132	2133	2134	2135	2136	2137	2138	2139	2140	2141	2142	2143	2144	2145	2146	2147	2148	2149	2150	2151	2152	2153	2154	2155	2156	2157	2158	2159	2160	2161	2162	2163	2164	2165	2166	2167	2168	2169	2170	2171	2172	2173	2174	2175	2176	2177	2178	2179	2180	2181	2182	2183	2184	2185	2186	2187	2188	2189	2190	2191	2192	2193	2194	2195	2196	2197	2198	2199	2200	2201	2202	2203	2204	2205	2206	2207	2208	2209	2210	2211	2212	2213	2214	2215	2216	2217	2218	2219	2220	2221	2222	2223	2224	2225	2226	2227	2228	2229	2230	2231	2232	2233	2234	2235	2236	2237	2238	2239	2240	2241	2242	2243	2244	2245	2246	2247	2248	2249	2250	2251	2252	2253	2254	2255	2256	2257	2258	2259	2260	2261	2262	2263	2264	2265	2266	2267	2268	2269	2270	2271	2272	2273	2274	2275	2276	2277	2278	2279	2280	2281	2282	2283	2284	2285	2286	2287	2288	2289	2290	2291	2292	2293	2294	2295	2296	2297	2298	2299	2300	2301	2302	2303	2304	2305	2306	2307	2308	2309	2310	2311	2312	2313	2314	2315	2316	2317	2318	2319	2320	2321	2322	2323	2324	2325	2326	2327	2328	2329	2330	2331	2332	2333	2334	2335	2336	2337	2338	2339	2340	2341	2342	2343	2344	2345	2346	2347	2348	2349	2350	2351	2352	2353	2354	2355	2356	2357	2358	2359	2360	2361	2362	2363	2364	2365	2366	2367	2368	2369	2370	2371	2372	2373	2374	2375	2376	2377	2378	2379	2380	2381	2382	2383	2384	2385	2386	2387	2388	2389	2390	2391	2392	2393	2394	2395	2396	2397	2398	2399	2400	2401	2402	2403	2404	2405	2406	2407	2408	2409	2410	2411	2412	2413	2414	2415	2416	2417	2418	2419	2420	2421	2422	2423	2424	2425	2426	2427	2428	2429	2430	2431	2432	2433	2434	2435	2436	2437	2438	2439	2440	2441	2442	2443	2444	2445	2446	2447	2448	2449	2450	2451	2452	2453	2454	2455	2456	2457	2458	2459	2460	2461	2462	2463	2464	2465	2466	2467	2468	2469	2470	2471	2472	2473	2474	2475	2476	2477	2478	2479	2480	2481	2482	2483	2484	2485	2486	2487	2488	2489	2490	2491	2492	2493	2494	2495	2496	2497	2498	2499	2500	2501	2502	2503	2504	2505	2506	2507	2508	2509	2510	2511	2512	2513	2514	2515	2516	2517	2518	2519	2520	2521	2522	2523	2524	2525	2526	2527	2528	2529	2530	2531	2532	2533	2534	2535	2536	2537	2538	2539	2540	2541	2542	2543	2544	2545	2546	2547	2548	2549	2550	2551	2552	2553	2554	2555	2556	2557	2558	2559	2560	2561	2562	2563	2564	2565	2566	2567	2568	2569	2570	2571	2572	2573	2574	2575	2576	2577	2578	2579	2580	2581	2582	2583	2584	2585	2586	2587	2588	2589	2590	2591	2592	2593	2594	2595	2596	2597	2598	2599	2600	2601	2602	2603	2604	2605	2606	2607	2608	2609	2610	2611	2612	2613	2614	2615	2616	2617	2618	2619	2620	2621	2622	2623	2624	2625	2626	2627	2628	2629	2630	2631	2632	2633	2634	2635	2636	2637	2638	2639	2640	2641	2642	2643	2644	2645	2646	2647	2648	2649	2650	2651	2652	2653	2654	2655	2656	2657	2658	2659	2660	2661	2662	2663	2664	2665	2666	2667	2668	2669	2670	2671	2672	2673	2674	2675	2676	2677	2678	2679	2680	2681	2682	2683	2684	2685	2686	2687	2688	2689	2690	2691	2692	2693	2694	2695	2696	2697	2698	2699	2700	2701	2702	2703	2704	2705	2706	2707	2708	2709	2710	2711	2712	2713	2714	2715	2716	2717	2718	2719	2720	2721	2722	2723	2724	2725	2726	2727	2728	2729	2730	2731	2732	2733	2734	2735	2736	2737	2738	2739	2740	2741	2742	2743	2744	2745	2746	2747	2748	2749	2750	2751	2752	2753	2754	2755	2756	2757	2758	2759	2760	2761	2762	2763	2764	2765	2766	2767	2768	2769	2770	2771	2772	2773	2774	2775	2776	2777	2778	2779	2780	2781	2782	2783	2784	2785	2786	2787	2788	2789	2790	2791	2792	2793	2794	2795	2796	2797	2798	2799	2800	2801	2802	2803	2804	2805	2806	2807	2808	2809	2810	2811	2812	2813	2814	2815	2816	2817	2818	2819	2820	2821	2822	2823	2824	2825	2826	2827	2828	2829	2830	2831	2832	2833	2834	2835	2836	2837	2838	2839	2840	2841	2842	2843	2844	2845	2846	2847	2848	2849	2850	2851	2852	2853	2854	2855	2856	2857	2858	2859	2860	2861	2862	2863	2864	2865	2866	2867	2868	2869	2870	2871	2872	2873	2874	2875	2876	2877	2878	2879	2880	2881	2882	2883	2884	2885	2886	2887	2888	2889	2890	2891	2892	2893	2894	2895	2896	2897	2898	2899	2900	2901	2902	2903	2904	2905	2906	2907	2908	2909	2910	2911	2912	2913	2914	2915	2916	2917	2918	2919	2920	2921	2922	2923	2924	2925	2926	2927	2928	2929	2930	2931	2932	2933	2934	2935	2936	2937	2938	2939	2940	2941	2942	2943	2944	2945	2946	2947	2948	2949	2950	2951	2952	2953	2954	2955	2956	2957	2958	2959	2960	2961	2962	2963	2964	2965	2966	2967	2968	2969	2970	2971	2972	2973	2974	2975	2976	2977	2978	2979	2980	2981	2982	2983	2984	2985	2986	2987	2988	2989	2990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North Carolina	474	45	40	427	113	1,291	1,123	1,291	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									

1. **Introduction**

Chicago	265	18	894	70	1,388	1,140	83	30
Los Angeles	110	76	872	82	1,348	988	147	100
New York	164	8	1,184	78	1,341	1,088	295	266

1000

Category & Quantity		Unit Price	Quantity	Total Price	Percentage
Accounting	1	1,000	1	1,000	0.1%
Advertising	1	1,000	1	1,000	0.1%
Archives	1	1,000	1	1,000	0.1%
Buying Agent	1	1,000	1	1,000	0.1%
Business	1	1,000	1	1,000	0.1%
Customer	1	1,000	1	1,000	0.1%
Other	1	1,000	1	1,000	0.1%
Total	7	7,000	7	7,000	100%

Industry Tied

88, 794 89, 879

NORTH ATLANTIC SCHEDULED AND CHARTER TRAFFIC — 1963

Month	Caribbean				Newfoundland			
	Passenger Flights	Caribbean Flights	Charter Flights	Total	Passenger Flights	Caribbean Flights	Charter Flights	Total
January	1,214,560	1,917,150	37,587	3,269,297	1,342,985	194,920	47,824	2,585,729
February	1,213,453	1,213,976	190,349	2,617,778	1,490,779	566,474	244,944	2,652,247
March	1,431,422	1,402,475	76,150	2,910,047	1,185,242	1,057,749	144,728	2,387,719
April	1,349,207	1,415,050	132,082	3,136,339	1,175,002	943,539	339,458	2,557,999
May	1,397,643	1,230,272	-	2,627,915	1,300,773	730,174	94,216	2,125,163
June	1,493,440	1,229,058	15,932	2,738,430	1,555,619	864,158	113,300	2,533,077
July	1,487,834	1,174,123	9,407	2,661,364	1,553,738	766,795	237,366	2,557,899
August	2,076,048	1,458,981	100,643	3,635,672	1,427,395	826,726	46,440	2,295,562
September	1,650,620	1,441,895	98,461	3,190,976	1,170,334	1,096,474	30,625	2,317,433
October	1,605,767	1,470,256	3,968	3,179,991	1,076,584	1,172,568	76,039	2,325,191
November	1,414,643	1,474,477	37,485	3,326,605	1,146,477	1,134,569	73,440	2,354,486
December	1,479,938	1,352,352	3,207	2,975,597	1,473,732	1,343,803	46,450	2,963,985
TOTAL	18,136,575	15,942,823	713,574	34,793,972	17,655,126	11,724,360	1,076,461	29,856,448

Mid

Month	Caribbean				Newfoundland			
	Passenger Flights	Caribbean Flights	Charter Flights	Total	Passenger Flights	Caribbean Flights	Charter Flights	Total
January	556,255	565,879	-	1,122,134	545,865	115,997	-	661,862
February	489,464	391,640	-	881,104	399,740	189,347	2,383	691,470
March	603,424	424,634	-	1,028,058	500,533	310,431	18	810,982
April	603,738	361,580	836	966,154	440,660	39,884	758	561,302
May	619,616	368,468	-	988,084	400,873	186,344	421	587,638
June	592,727	345,526	-	938,253	497,540	183,713	11	681,264
July	586,142	314,921	-	901,063	482,758	97,397	-	580,155
August	640,550	332,471	-	973,021	492,471	90,289	-	582,760
September	642,040	314,504	6,445	962,989	503,896	56,357	491	560,744
October	715,217	366,176	-	1,081,393	503,399	37,357	491	541,247
November	781,472	361,758	-	1,143,230	440,497	117,778	-	558,275
December	1,056,784	569,058	-	1,625,842	945,834	215,520	-	1,161,354
TOTAL	7,906,292	4,429,154	3,461	12,338,907	6,234,499	1,357,467	3,992	7,595,968

EXPLANATION: SCHEDULED SECTION
DATA IS BASED ON DEPARTURES

North Atlantic Summer Load Factors Up

New York—Business for the 18 scheduled airlines from the North Atlantic has been good this summer compared with the same period of 1962, with each going to group fares and last-destination efforts of last May's stock market slump.

By mid-August, industry volumes for the three-month period of June, July and August had already exceeded the totals recorded for all three of those months in 1962. Almost all carriers flying between the United States, Canada and Europe reported load factors up substantially.

IATA figures show that between June 1 and Aug. 18, scheduled passenger volumes totaled 467,925, which was 47,854 more than was reported from June through August last year. West-bound volumes were likewise ahead by mid-August, up 8,870 over the 310,849

carried in the three months up to Aug. 17, 1962. And this year's big northbound movement of returning tourists was well on course.

Industry load factors during the peak months of July rose only about 2 points to 57.45%, indicating the increase of 35,189 available seats both ways across the Atlantic between June 1 and Aug. 18.

July showed the most equal balance of load factors for the period with 55.61% westbound and 59.11% east-bound. This compares with June, which reflected the seasonal impact of last-destination travel more by its 70.21% east-bound load factor, 40.2% westbound.

Individual carriers who did not increase capacity extremely reported load factors below the industry average. Sabena, British World Airways, for example, booked its eastbound July load

below its 72.15% compared with 57.95% in the same month last year.

Although most carriers' sales officials say they have yet to fully realize the effect of group fares on this summer's results, they agree generally that the lower fares for groups of 25 persons or more have generated new business.

U.S. airlines that fly from April through August group fares accounted for 9% of its common air business between the U.S. and Europe. KLM Royal Dutch Airlines figures the group fares accounted for just 1.5% of its common U.S. passenger sales between April and July.

The public did not seem fully aware of the advantages offered by the group fares until early summer, a KLM spokesman said. But one group began to pick up sharply in late June.

Officials of other carriers contend that the group fare was one of the least fruitful that is proving a good source of filling otherwise empty seats and that this will become a permanent part of the industry's year-around fare structure.

Although passenger volumes are up, consequently, carriers are not increasing profits on net revenue. Most of the traffic has been in the container class, cutthroat by price when container load factors showed 75%.

Container load factors with summer sales accounted for only 15.4% of total air accommodations in July. This ratio dropped further in July, when container load factor rose to 65.6% while first class seat demand fell 15.4%. And even though the group fare from New York to Los Angeles was up 15% from last year, other carriers' spokesmen said that this is supplemental revenue which won't help much unless accompanied by a round line of regular fare traffic.

British Overseas Airways Corp. for example, reports passenger volumes up 12%, but its spokesman said that revenue services had not been sufficient to make the gains hoped for this year.

"While fares have gone down, container group up," the spokesman said. "This situation has held back our profit rate."

BOAC is one of the carriers advocating stronger competition against the North Atlantic airlines toward development of the overall market, the group spokesman said. A program being now under advertising and joint promotional efforts.

The secretary's record has also shown that the scheduled carriers created the stock market drop which came just as the season was getting under way. Sales officials feared a sale of market conditions of the market did not create a firm recovery.

"It obviously had some effect although we'll probably never know how much," said airline spokesman said.

"But it came after most reservations were made and, apparently, the majority of people were still on vacation fares."

"However," he continued, "I don't like to think what might have happened had the market drop occurred two or three weeks earlier."

One U.S. carrier official, while admitting the beneficial effect of group fares, said the effect of group fares on advertising spend and the press, radio and television, feels that 1963 was simply one of the "good years" in the cycle of transatlantic travel.

"We have a strong on our airline that even after we've even increased our on-air campaign for years."

This person has said that while transatlantic travel has been the exception in 1963, he said, and 1969's good share was more a result of lower charter business than anything else.

This spokesman recorded American West that last year's economy's low

NORTH ATLANTIC SCHEDULED AND CHARTER TRAFFIC — 1962

Month	Caribbean				Newfoundland			
	Passenger Flights	Caribbean Flights	Charter Flights	Total	Passenger Flights	Caribbean Flights	Charter Flights	Total
January	556,255	565,879	-	1,122,134	545,865	115,997	-	661,862
February	489,464	391,640	-	881,104	399,740	189,347	2,383	691,470
March	603,424	424,634	-	1,028,058	500,533	310,431	18	810,982
April	603,738	361,580	836	966,154	440,660	39,884	758	561,302
May	619,616	368,468	-	988,084	400,873	186,344	421	587,638
June	592,727	345,526	-	938,253	497,540	183,713	11	681,264
July	586,142	314,921	-	901,063	482,758	97,397	-	580,155
August	640,550	332,471	-	973,021	492,471	90,289	-	582,760
September	642,040	314,504	6,445	962,989	503,896	56,357	491	560,744
October	715,217	366,176	-	1,081,393	503,399	37,357	491	541,247
November	781,472	361,758	-	1,143,230	440,497	117,778	-	558,275
December	1,056,784	569,058	-	1,625,842	945,834	215,520	-	1,161,354
TOTAL	7,906,292	4,429,154	3,461	12,338,907	6,234,499	1,357,467	3,992	7,595,968

Month	Caribbean				Newfoundland			
	Passenger Flights	Caribbean Flights	Charter Flights	Total	Passenger Flights	Caribbean Flights	Charter Flights	Total
January	556,255	565,879	-	1,122,134	545,865	115,997	-	661,862
February	489,464	391,640	-	881,104	399,740	189,347	2,383	691,470
March	603,424	424,634	-	1,028,058	500,533	310,431	18	810,982
April	603,738	361,580	836	966,154	440,660	39,884	758	561,302
May	619,616	368,468	-	988,084	400,873	186,344	421	587,638
June	592,727	345,526	-	938,253	497,540	183,713	11	681,264
July	586,142	314,921	-	901,063	482,758	97,397	-	580,155
August	640,550	332,471	-	973,021	492,471	90,289	-	582,760
September	642,040	314,504	6,445	962,989	503,896	56,357	491	560,744
October	715,217	366,176	-	1,081,393	503,399	37,357	491	541,247
November	781,472	361,758	-	1,143,230	440,497	117,778	-	558,275
December	1,056,784	569,058	-	1,625,842	945,834	215,520	-	1,161,354
TOTAL	7,906,292	4,429,154	3,461	12,338,907	6,234,499	1,357,467	3,992	7,595,968

EXPLANATION: SCHEDULED SECTION
DATA IS BASED ON DEPARTURES

NORTH ATLANTIC SCHEDULED AND CHARTER TRAFFIC — 1961

Month	Caribbean				Newfoundland			
	Passenger Flights	Caribbean Flights	Charter Flights	Total	Passenger Flights	Caribbean Flights	Charter Flights	Total
January	556,255	565,879	-	1,122,134	545,865	115,997	-	661,862
February	489,464	391,640	-	881,104	399,740	189,347	2,383	691,470
March	603,424	424,634	-	1,028,058	500,533	310,431	18	810,982
April	603,738	361,580	836	966,154	440,660	39,884	758	561,302
May	619,616	368,468	-	988,084	400,873	186,344	421	587,638
June	592,727	345,526	-	938,253	497,540	183,713	11	681,264
July	586,142	314,921	-	901,063	482,758	97,397	-	580,155
August	640,550	332,471	-	973,021	492,471	90,289	-	582,760
September	642,040	314,504	6,445	962,989	503,896	56,357	491	560,744
October	715,217	366,176	-	1,081,393	503,399	37,357	491	541,247
November	781,472	361,758	-	1,143,230	440,497	117,778	-	558,275
December	1,056,784	569,058	-	1,625,842	945,834	215,520	-	1,161,354
TOTAL	7,906,292	4,429,154	3,461	12,338,907	6,234,499	1,357,467	3,992	7,595,968

Month	Caribbean				Newfoundland			
	Passenger Flights	Caribbean Flights	Charter Flights	Total	Passenger Flights	Caribbean Flights	Charter Flights	Total
January	556,255	565,879	-	1,122,134	545,865	115,997	-	661,862
February	489,464	391,640	-	881,104	399,740	189,347	2,383	691,470
March	603,424	424,634	-	1,028,058	500,533	310,431	18	810,982
April	603,738	361,580	836	966,154	440,660	39,884	758	561,302
May	619,616	368,468	-	988,084	400,873	186,344	421	587,638
June	592,727	345,526	-	938,253	497,540	183,713	11	681,264
July	586,142	314,921	-	901,063	482,758	97,397	-	580,155
August	640,550	332,471	-	973,021	492,471	90,289	-	582,760
September	642,040	314,504	6,445	962,989	503,896	56,357	491	560,744
October	715,217	366,176	-	1,081,393	503,399	37,357	491	541,247
November	781,472	361,758	-	1,143,230	440,497	117,778	-	558,275
December	1,056,784	569,058	-	1,625,842	945,834	215,520	-	1,161,354
TOTAL	7,906,292	4,429,154	3,461	12,338,907	6,234,499	1,357,467	3,992	7,595,968

EXPLANATION: SCHEDULED SECTION
DATA IS BASED ON DEPARTURES



New Shell hydrant refueling system can top off thirty aircraft at once—at more than 13,000 gallons a minute

A radically new Jet Age airport design concept is making Los Angeles International one of the most efficient major air terminals in the world. A special Shell hydrant refueling system helps make the concept work. Here's how:

At Los Angeles International, planes have designed seven slide-like passenger terminals called Satellite. Each is completely surrounded by aircraft parking areas.

Each "Island" Satellite can handle ten jets at one time. Jets can go directly from ramp up to a Satellite load, thus save out with almost no unnecessary delays. Congestion in taxing and parking areas is minimized.

First Satellites are opening now. A sixth is scheduled for 1964. A seventh will be back when traffic increases.

How new Shell fueling system helps make Satellite plan work

An important reason the Satellite also works so well is Shell's new accurate controlled hydrant fueling system which serves three Satellites.

The maximum capacity for the first generation Satellites is 30 aircraft. The

new Shell system can already handle 20 at one time during peak loading periods. By late 1965, that number will be increased to 30.

The Shell system also receives three of the seven diameter trunk lines, all three of the local service lines and six of the eight international carriers that fly into Los Angeles International.

Shell system amazingly simple

Refueling hydrants are flush with the ramp surface at each Satellite's taxi parking spaces. A phone cable between two hydrants. Then, small, Shell-designed pumping units connect the hydrant to the trench and pump fuel aboard.

Among the system's features:

1. Remote control. Shipment of fuel from refinery to airport storage is controlled from Shell's Los Angeles office. A dispatcher can direct fuel

shipments with a touch on a button.

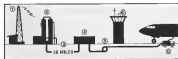
2. Entire pipeline is underground. An 18-mile underground pipeline connects Shell's Wilmington refinery with the airport storage area. Other lines run out to the ramp hydrants.

This closed system eliminates many handling steps and helps to guard fuel against possible contamination. There is no need for large tank trucks which could cause congestion at the ramp area.

3. Filters fuel three times before delivery. From drop off it is pooled through filter/separators. It is screened first at airport storage, again at a booster pumping station and again at the hydrant unit.

4. Can pump fuel at a rate of 13,000 gallons a minute to its three fuel lines. Each hydrant unit can pump fuel at 600 gpm. Two units work at a time for each aircraft served.

Other types of Shell designed fueling systems are at work at San Francisco, Atlanta and New York. Another is now being built in Anchorage.



Remote-controlled refueling system. Dispatcher at Los Angeles (1) sends fuel from refinery (2) through 18 mile underground pipeline (3) to airport storage (4). From storage booster station (5) it flows ready to pump fuel to refueling hydrant (6). Two hydrant units can then fuel directly to the rate of 13000 gallons a minute.

▲ New Shell aircraft refueling system at Los Angeles International. Hydrant can pump fuel from underground storage through filter/separators into aircraft.



MOHAWK AIRLINES, FIRST IN REGIONAL
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THE FIRST PURE JET SPECIFICALLY
DESIGNED FOR SHORT HAUL AIR TRAVEL,
SCHEDULED FOR SERVICE EARLY 1965.

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POWERED BY TWO **ROLLS-ROYCE**
SPRY II FAN JET ENGINES.



MOHAWK ORDERS JETS



MOHAWK AIRLINES INC.

lent of heavy summer business was split. Although a depressed U.S. economy and overcapacity on jet routes the most consistently blunted crosses of 1964's showing, it hasn't been clear since whether jet will force people crowded to Europe last year be and.

TWA's World Airline¹ passenger volume this year reflect the up-and-down, noisiness of transatlantic travel. TWA's summer passenger miles for June and July totaled 275,520,000, up 23.8% over the same months of 1963 but 1.3% less than the comparable period of 1960.

Strike Threats

TWA and Pan American World Air service both agree that if airfares kept the summer from being more productive, it was the strike threats made against them both in the Flight Engineers International Union, and in the Transport Workers Union against Pan Am.

The two unions announced strike dates at various times, and both TWA and Pan Am said they were draped off approach each time. Since then, both airlines have signed new agreements with the flight engineers, although Pan Am still has to reach settlement with the TWA.

Another indication of the widespread problems can have an air carrier's business is that several large flag carriers credit TWA and Pan Am's delin-

ties with having more business in them during the strike threats.

Alitalia reported one of the best increases this summer, with its load factor up 18% compared on the line at 75.7% passenger miles through June and August. Its load factor was 65% for this period, compared with 99% in the same period last year. Alitalia's gross primary credit to one flag—Italy's growing attraction as a tourist destination—has its business growth.

Silene, one of the carriers to most feel last year's low volumes, rebounded this July with a record 6,737 passengers flown to France, 44% more than in the same month last year. Silene's load factor was 60%, compared with 48% in July 1961. August too saw a record for Silene with 5,000 passengers to Europe, double the volume of August last year.

Alitalia, flying its seven weekly flights between New York and Europe, recorded a 99% increase in enplaned passengers during May, June and July, with its load factor improving 46% in the period.

Air France credits the group fares for a major part of its 49% increase in transatlantic passengers carried this summer. "Group traffic has been going up," an Air France spokesman said. "And second class travel agencies have told us that Air France has been among the top carriers of group fares." The French airline says its charter business

has picked up significantly this year. Its midsummer Airline System traffic last June, July and August together was up 21.9%, but isolated in one group fares fell credit for the growth. "Most of the European travelers this summer are making their second and third trips at \$35 per person," said, and global surveys indicate that Scandinavian rates among 1962's top tourist attractions.

Swire recorded a monthly traffic increase of 24.6% during May, June and July. August figures still uncompleted indicate that the average will hold through that month.

Steady Rise

Lufthansa's passenger volume steadily increased through the summer to a 26.1% rise in August, but expenses for the German carrier are going less well than to do with the growth. Lufthansa's July load factor was 64.2%, compared with 60.9% the same month last year.

Pan American World Airways gave no figures on passenger volumes this summer but did indicate for the summer and Pan Am did not consider this season a particularly good one. Pan Am did have increases this year, although its North Atlantic growth percentage would not be so great as that of other carriers since Pan Am's business in the same period of 1961 was better than the industry average.

IATA South Atlantic Traffic Statistics

SCHEDULED OPERATIONS	1959			1960			1961			CHANGE
	NORTH-AMERICA	SOUTH-AMERICA	OTHER	NORTH-AMERICA	SOUTH-AMERICA	OTHER	NORTH-AMERICA	SOUTH-AMERICA	OTHER	
Flights	323	103	204	328	134	194	33	33	30	+3.3%
Passenger Miles	7,727	788	2,450	8,053	1,475	2,578	80	546	3,495	+3.3%
Load Factor	52.7	50.1	52.0	52.1	51.5	52.4	67.5	67.1	72.0	+3.3%
Passenger Capacity	16,034	24,732	32,510	14,826	34,412	25,238	15,365	25,496	37,644	+36.2%
First Class	25,779	28,413	37,272	24,715	34,229	25,644	8,115	8,932	16,248	+36.4%
Economy	—	—	—	2,797	3,287	2,594	41,653	42,514	23,238	+31.8%
Passenger Miles	15,763	117,305	107,433	15,737	125,230	120,915	43,215	43,245	126,691	+36.2%
Passenger Miles	8,628	7,955	15,533	9,033	8,462	17,495	52,565	52,565	11,114	+36.2%
First Class	16,057	15,258	32,107	26,781	24,781	32,903	4,903	4,903	4,338	+33.7%
Economy	—	—	—	837	581	7,712	28,536	28,616	37,154	+32.0%
Passenger Miles	28,585	21,705	58,330	26,693	35,645	35,162	13,565	13,565	38,816	+35.4%
Load Factor	47.2%	43.3%	47.6%	61.6%	50.0%	58.8%	58.9%	57.8%	57.8%	+2.8%
First Class	58.6%	53.2%	56.9%	75.6%	70.0%	73.6%	52.6%	52.6%	52.6%	+22.2%
Economy	—	—	—	63.6%	48.2%	65.2%	65.2%	65.2%	65.2%	+2.2%
AVERAGE	55.6%	54.2%	58.9%	71.2%	47.0%	61.4%	63.4%	63.4%	63.4%	+2.2%

¹ 1960 - Economy class service opened May 1st only

² 1961 - Traffic class service opened Jan-Feb only

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Turbine Aircraft Operating Expenses—Dollars Per Total Hour First Six Months of 1962

	Total Hours	Average Operating Expenses— First Six Months 1962			Total Direct	Maintenance Budget	Total Maintenance	Total Aircraft Expenses
		Flying Operations	Direct Maintenance	Expenses & Sundry				
BOEING 707								
Per American	31,458	241.66	179.90	136.81	558.37	129.48	687.85	1,246.22
Trans World	46,077	488.84	127.33	167.77	783.94	119.19	903.13	1,817.07
American	31,458	241.66	179.90	136.81	558.37	129.48	687.85	1,246.22
Continental	30,717	473.64	179.91	144.84	798.39	144.83	943.22	1,891.61
Bozell	4,706	482.37	179.46	179.46	841.29	144.83	986.12	2,037.41
Western	1,185	149.89	179.46	179.46	508.81	144.83	653.64	1,162.47
Total average	104,968	471.36	179.46	179.46	828.12	131.23	959.35	2,018.47
DOUGLAS DC-8								
United	47,124	289.48	126.48	149.38	565.29	109.34	674.63	1,244.44
Per American	30,143	289.48	126.48	149.38	565.29	109.34	674.63	1,244.44
Eastern	34,276	484.54	154.86	164.14	803.54	144.84	948.38	1,896.92
Northwest	13,281	209.14	149.86	129.48	508.48	119.86	628.34	1,136.82
Delta	10,248	441.11	109.37	270.61	821.09	109.37	930.46	1,861.55
Midland	8,471	57.99	149.86	119.86	367.71	144.83	512.54	880.29
Pacific	7,432	209.14	149.86	119.86	478.86	144.83	623.69	1,102.52
Trans-Continental	7,432	408.14	179.83	179.83	767.80	144.83	912.63	1,677.46
Total average	161,447	429.17	149.86	149.86	868.34	119.86	988.20	2,076.50
BOEING 737								
American	24,879	289.48	179.31	202.74	669.53	143.45	812.98	1,682.51
United	21,046	374.17	15.43	144.83	534.43	109.34	643.77	1,188.20
Eastern	30,143	484.54	154.86	164.14	803.54	144.84	948.38	1,896.92
Northwest	13,281	209.14	149.86	129.48	508.48	119.86	628.34	1,136.82
Delta	10,248	441.11	109.37	270.61	821.09	109.37	930.46	1,861.55
Midland	8,471	57.99	149.86	119.86	367.71	144.83	512.54	880.29
Pacific	7,432	209.14	149.86	119.86	478.86	144.83	623.69	1,102.52
Trans-Continental	7,432	408.14	179.83	179.83	767.80	144.83	912.63	1,677.46
Total average	103,181	381.33	149.86	179.37	769.80	119.86	889.66	1,809.46
CONVAIR 440								
American	9,404	484.54	149.31	559.79	1,193.64	121.27	1,314.91	2,508.55
CONVAIR 580								
Trans World	24,879	424.23	119.16	179.86	723.25	109.81	833.06	1,666.31
United	17,154	381.33	149.86	149.86	681.05	119.86	800.91	1,481.96
Northwest	13,281	209.14	149.86	129.48	508.48	119.86	628.34	1,136.82
American	24,879	424.23	119.16	179.86	723.25	109.81	833.06	1,666.31
Total average	50,861	441.19	149.36	169.37	763.48	119.86	883.34	1,746.82
SUB CARAVELLE								
United	17,154	381.33	149.86	149.86	681.05	119.86	800.91	1,481.96
CANADIAN CL-44								
Eastern	4,409	381.33	149.86	149.86	681.05	119.86	800.91	1,481.96
Pacific	12,723	209.14	149.86	129.48	508.48	119.86	628.34	1,136.82
Trans	1,094	209.14	149.86	129.48	508.48	119.86	628.34	1,136.82
Total average	18,486	289.86	149.86	149.86	748.01	119.86	867.87	1,596.87
AM-650 ARGOSY								
United	2,723	129.07	49.18	93.33	271.58	14.46	286.04	344.12
LOCKHEED ELECTRA								
Eastern	40,481	381.33	149.86	149.86	681.05	119.86	800.91	1,481.96
American	24,879	424.23	119.16	179.86	723.25	109.81	833.06	1,666.31
Northwest	13,281	209.14	149.86	129.48	508.48	119.86	628.34	1,136.82
Delta	10,248	441.11	109.37	270.61	821.09	109.37	930.46	1,861.55
Midland	8,471	57.99	149.86	119.86	367.71	144.83	512.54	880.29
Pacific	7,432	209.14	149.86	119.86	478.86	144.83	623.69	1,102.52
Total average	128,844	381.33	149.86	149.86	681.05	119.86	800.91	1,481.96
VICKERS VISCONTI								
United	17,154	381.33	149.86	149.86	681.05	119.86	800.91	1,481.96
Continental	17,154	381.33	149.86	149.86	681.05	119.86	800.91	1,481.96
Northwest	13,281	209.14	149.86	129.48	508.48	119.86	628.34	1,136.82
Total average	47,589	381.33	149.86	149.86	681.05	119.86	800.91	1,481.96
CONVAIR-540								
American	2,349	129.07	49.18	93.33	271.58	14.46	286.04	344.12
FAIRCHILD F-27								
American	17,154	381.33	149.86	149.86	681.05	119.86	800.91	1,481.96
Northwest	13,281	209.14	149.86	129.48	508.48	119.86	628.34	1,136.82
Delta	10,248	441.11	109.37	270.61	821.09	109.37	930.46	1,861.55
Pacific	8,471	57.99	149.86	119.86	367.71	144.83	512.54	880.29
Continental	7,432	209.14	149.86	119.86	478.86	144.83	623.69	1,102.52
Total average	56,599	381.33	149.86	149.86	681.05	119.86	800.91	1,481.96
SKODSKY 5-61								
Los Angeles	829	119.44	29.86	79.66	228.96	16.17	245.13	295.30
VERTOL-107								
New York	279	59.91	1.19	19.85	80.95	1.19	82.14	94.42

* Real quotes, 1962

AIRLINE OBSERVER

► **Non-scheduled** airline operations in 1981 represented less than 5% of scheduled airline operations on world routes, but accounted for about 25% of all passenger fatalities for the year, according to International Civil Aviation Organization figures. ICAO also reported 33 fatal accidents on non-scheduled cargo flights for 1981, which, it says, most reflect a high accident rate because cargo flights flying separately consecutively a small portion of all world air transport operations.

► **Foreign flag carriers** are charging that the recent U.S. drive to encourage federal government employers to use U.S. rather than foreign airlines on international flights will prove costly to air travelers. On a recent flight to meet 180 Peace Corps personnel from San Francisco to Japan, one scheduled foreign flag carrier bid approximately \$51,000 to carry the group, about \$99,000 less than the bid of a U.S. carrier which was ultimately awarded the contract. U.S. officials say the foreign carrier lost the bid for failing to file its bid within the specified time period.

► **Watch for action** soon on the proposed merger between Pan American World Airways and Trans World Airlines. Full agreement between the two carriers has been reached and a filing of the proposal with the Civil Aeronautics Board is expected this week.

► **Flight Magazine** quotes this story from the London Daily Telegraph: A British Overseas Airways Corp. jet overtook an Aer Lingus jet on the North Atlantic route. "Why so slow, Dublin?" asked the BOAC pilot, "flying trouble?" Replied his Irish rival, "not at all—just carrying a full load."

► **Scandinavian Airlines System** plans a 15% reduction in maintenance personnel over its entire system. SAS estimates that it will require about 550 less technical and maintenance workers if the work on any one particular aircraft can be concentrated at only one airport. Under this plan, SAS technical personnel in Sweden would be reduced by about 250, in Denmark by about 148 and in Norway by 58.

► **Interline business** of the U.S. continental airlines increased 7.3% to \$68.5 million in July, compared with \$74.1 million for the same month last year. An Transport Asia figures show an industry total of \$68 million in interline business for the first seven months of this year, compared with \$56.5 million for the same period of last year.

► **International Transport Workers Federation** is pressing for more extensive regulations for flight engineers and certification of International Conference of Aviation Organization maintenance regulations. ITW's Charles Flight engineers because they'd require basic civil aviation engineering training and ground operations qualifications should be continuously revised to keep pace with aircraft technological changes.

► **Transport Union** has rejected any affiliation with the Flight Engineers International Association members of Eastern Air Lines, but a treaty to recruit the carrier's 4,000 mechanics, members of the International Association of Machinists. The IMA-led union is also trying IAW members at Northwest Airlines.

► **Iraq Airways** plans to purchase two Boeing 703B tanker aircraft. Decision not made by the Iraqi government on the basis of a detailed evaluation of offers submitted by several manufacturers.

► **Russia continues** to concentrate much of its Alaska aviation aid on the Republic of Ghana. Aeroflot, the Soviet-owned airline, recently inaugurated twice-week service between Moscow and Accra, and the Ghanaian government is expected to take delivery soon of a specially designed aircraft now under construction in a Kirov, Ukraine aircraft factory.

► **El Al** plans to inaugurate its first jet service to Europe on Jan. 15. The airline expects to take delivery on its order of two Boeing 703Bs early in December and will begin jet service with twice-weekly flights between Athens and Madrid. One flight will probably terminate in Frankfurt and the other in Madrid.

SHORTLINES

► **Alitalia Airlines** has purchased autopilot retrofit kits to improve the all weather, low-approach capability of its Douglas DC-8 jet transport. The kits, obtained from Douglas and Sperry Phoenix will add glide slope indicators and vertical path control capabilities to the aircraft's SD 10 autopilot (AW Dec 14, p. 85; Nov 28, 1980, p. 70).

► **Allegiance Airlines** had a net profit of \$8,137 on revenues of \$2 million in July, compared with a net loss of \$57,445 on revenues of \$1.7 million in July, 1981. For the seven month period ended July 31, Allegiance showed a net profit of \$196,721 on revenues of \$13.2 million. Same period last year showed a net loss of \$258,687 on revenues of \$11.3 million.

► **Bonair Airways** has engaged a Lockheed Electric railwaying assault with a Garrett-AirResearch Manufacturing Division gas turbine oil burning engine. The installation permits the aircraft to operate independent of ground starting equipment. Eight more Bonair Electra-ns are scheduled for the conversion.

► **California Automotive Corp.** of North Hollywood, has bought its DC7 aircraft from General Dynamics Corp. for resale to lease General Dynamics had acquired the aircraft from American Airlines which bought 20 Convair 990s.

► **LANChile airlines** has filed new reduced fares with Civil Aeronautics Board and International Air Transport Association to meet competition from low-cost non-IATA carriers operating prices agreements between South America and U.S. points. The move illustrates the continuing fight for passenger between IATA and non-IATA carriers in the highly competitive U.S.-Latin American market (see p. 80).

► **Northwest Airlines** reports revenues for July totaled \$13.8 million accompanied by net profits of \$1 million. Figures for July 1981 indicate revenues of \$16.8 million, profits of \$396,328.

► **Pan American World Airways** is in conference with American, Trans World and Continental will also be subject to new four-pointed (between continental U.S. points and Hawaii). One group having hotel and engineering accommodations in Hawaii will be eligible. Typical reduced fare will be combining New York-Honolulu \$417, compared with the present \$516 round trip coach economy class fare. Fares will become effective Sept. 18 subject to CAB approval.



John and Susan aren't really going anywhere. There's a child's world of make-believe. Still, we think they've got the right idea about how to go places, and in many ways they're the symbol of our industry. These youngsters are growing up in an exciting world of aviation which offers to all of us

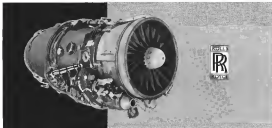
the challenge to be of even greater service. It is in this spirit that we welcome the delegates to the LATA Conference in Dallas.

AER LINGUS

Mr. John and Susan aren't going anywhere yet. But one day the world will be their space and we'll help to make it so.

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U.S. to Ease Transport Political Pressure

Formal move to ease current strains in the relationship between U.S. airlines and foreign flag carriers under a program stressing economic liberty will be the focus of a revised U.S. international air transport policy, AVIATION WEEK has learned.

White House study on international aviation (AW Aug. 6, p. 38), from which the new U.S. policy will evolve, was completed an schedule last month but is still being withheld under a confidential clarification and is not likely to be released publicly for at least another month. Nevertheless, it is now clear that the U.S. will soon embark on a completely revamped program designed to relax political pressures and place heavy stress on the economic character of air transportation.

Policy problems of capacity and co-ordination of routes, which have kept U.S. carriers and their competitors embroiled in bitter wangling for at least four years, are not included in the agenda of the International Air Transport Association's general meeting which opened today. However, these areas will face a direct address as decisions reached on other subject matter during the course of the biennial session.

Essentially, the revised policy will be based on the principle that U.S. international air transportation is a commercial enterprise, not a political device nor an arm of U.S. foreign relations programs. Majority of U.S. carriers have long sought the adoption of this concept, although force events, on occasion, have stressed the political aspects of an issue to strengthen a point in their favor.

Generally, however, U.S. airlines have emphasized the importance of economic health in their attitude and in a successfully self-sufficient industry. They have consistently charged that State Department use of international routes as a bargaining tool in foreign policy not only has distorted an understanding of foreign competition but has imposed a steady revenue and traffic drain from U.S. airlines.

Under the new policy, the decline of U.S. reliance share of traffic, particularly in the North Atlantic market, will not be considered as a factor in dealings with other nations. In fact, the guidelines will be not how the market should be divided between U.S. and competing carriers, but how can the one-off market be expanded and expanded.

As a result, recent U.S. attempts to compel foreign flag carriers to restrict capacity in select schedules on North Atlantic routes will be brought to a halt. Such proposed legislation is that supported by the Air Transport Association for an exchange of traffic statistics, and the introduction of new restrictions on the part of the carriers of foreign air carriers previously considered the new policy.

That, one of the aims of the new policy is that the U.S. will no longer be culpable in inflicting international air transport problems but will, however, apply pressure. What seems that in negotiations over such issues as the interpretation of bilateral agreements and their capacity clauses, the U.S. will not attempt to compel other nations to conform to its interpretation as it has in a number of occasions (AW June 30, 1960, p. 35), but will bargain on a quid-pro-quo basis.

For example, the study group will provide no firm policy for air transportation in South America but will recommend that South American carriers are first asked their opinion as to the solution of problems on that continent and, then, establish a policy on the basis of the answers received.

Since the loss of traffic by U.S. carriers has been the cause of the industry's disapproval in some form of control over foreign carriers, U.S. airlines will be forced to re-evaluate their competitive position vis-à-vis foreign carriers. On the other hand, U.S. airlines will find some relief in the new policy's approach toward the so-called "give-away" program of the State Department with respect to the marketing of routes.

The policy will require that no control over routes operating between major ports of entry will be enforced. On the other hand, the words of routes beyond point of entry, in ports within the U.S., will be retained.

The policy will not encompass the problems of multiple designations. The group has made no recommendations as to whether the U.S. should adopt the "closed instrument" theory or continue to allow U.S. carriers to compete with one another on international routes. Apparently, this issue is considered to be outside the realm of policy and with the jurisdiction of the CAB.

Decisions on policy will depend to a large degree on the response of other nations to the plan. Members of the study group noted the governments at least from nations during the first two stages of the policy and from which varied reactions. Scandinavian and Dutch were not contacted as the European nations through differences between these two countries and the U.S. have been noted by themselves.

The group found the approach to be unusual in the study group's approach to the development of a U.S. policy and expressed the belief that the U.S. and England should work together in strengthening international transportation. The British noted that the U.S. had indicated its leadership as an institution by replacing an equal policy of bilateral with one of restraint.

British held that the U.S. and Britain should cooperate closely in making that leadership. The French also wanted such cooperation but noted one step further in suggesting a U.S. French pact in the North Atlantic.

Both countries felt that at certain should schedule flights where traffic is available without restriction.

Talks with the Italians and Germans were apparently unproductive and were considered as a highly formal basis which the U.S. study group deplored since it had to stand open and frank opinions in an unbroken atmosphere. At the present time, Adams and Lufthansa are two of the fastest growing competitors of TWA and Pan American World Airways in the North Atlantic area in terms of revenue passenger miles handled.

U. S. Participation in Air Passenger Traffic 1950-1961

Number of passengers flown between the U. S. and the rest of the world				
Year Ended	U. S. Flag	Foreign Flag	Total	U. S. %
June 30	(Thousands)	(Thousands)	(Thousands)	of Total
1950	877	1,094	1,971	44.5
1951	946	987	1,933	49.0
1952	1,018	986	1,994	51.1
1953	1,081	941	2,022	53.5
1954	1,150	870	2,020	57.0
1955	1,228	951	2,179	56.4
1956	1,301	929	2,230	58.3
1957	1,375	1,142	2,517	54.6
1958	1,448	1,247	2,695	53.7
1959	1,521	1,264	2,785	54.6
1960	1,595	1,301	2,896	55.1
1961	1,670	1,354	3,024	55.2

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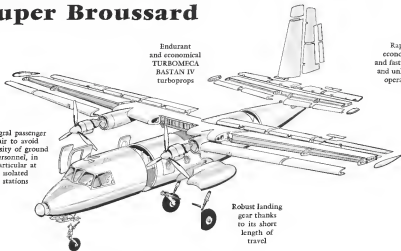
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Support Grows for Supra-National Airline

Common-Support appears to be slowly building within some factions of Western Europe for eventual formation of an all-encompassing supra-national airline. This is despite current concern over the future potential, or even final organization, of the latest first step: Air Union and lack of concrete knowledge of the problems and hazards such a major advance would entail.

Air Union, with relatively modest goals, has been under consideration by West Germany, France, Italy and Belgium since the spring of 1970, and, as of early this month, its backers were still awaiting the first national ratification of the organization's aims—the actual requirement for consolidation.

During the interim between intent and approval, the fortunes and economic development of the individual carriers have defied an optimistic support base with each new sweep touching off resistant demands for added recognition as a condition of membership.

Potential advantages to be gained versus potential loss constantly are assessed by airline managements and top political officials alike.

Delays, policy switches and doubts surrounding Air Union ultimately would give pause to the supporters of a rapid European airline project. These experiences confirm, however, that Air Union is as much a step before its time, pressed onto paper while national flag-carrier feelings still run high and before the cost impact of any future expense language can be felt.

One of the most interesting prospects in the Common Market is the "European Treaty of Rome" establishing the Common Market, a part of the future in Europe, specifically includes an attempt to do so with which the organization can deal.

At the time of the signing of the treaty—and today—air transport was too difficult a subject to be included in such a broad plan, since almost every nation employs it as an instrument of prestige, to "show the flag" and to impress other countries with its special of interest and ability.

Individual members within the present consortium, however, believe an attempt should come under Common Market rules with the eventual goal of at least giving the organization powers roughly comparable with those of the Civil Aeronautics Board, enabling authority to assign international and intra-European routes as well as to frequencies in order to guarantee competition and, at the same time, boost the profit factor.

While ruling Council of Ministers probably will be asked to consider such

an amendment during their next session scheduled for Sept. 27 and, just as probably, that will come it down to a good majority. Backers of the amendment recognize this and accept it, but hope that, with time and a loosening of nationalisms, a similar proposal will be accepted sooner.

Aside from the hearing last that Air Union is directed primarily toward the Atlantic enclaves to U.S. and British transatlantic routes, broken of the amendment believe that any enduring structure must include representatives of all the Common Market nations.

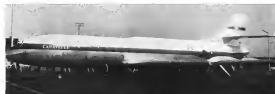
Air Union, however, could serve as an effective link between the presently possible and the ultimate, while, at the same time, providing the desired increased competition to other transatlantic airlines.

Also, Air Union is not a closed consortium and could be expanded to accept other members within its mandate. The Common Market upon approval of its present operation. The airline joint-venture possibility of Air France, Deutsche Lufthansa, Alitalia and Sabena, however, would remain unchanged within the network once the initial agreement among them is finally approved.

Quotas themselves also are a source of debate. KLM Royal Dutch Airlines, an original Air Union sponsor, formerly withdrew from the proposed organization shortly after its inception because it felt its quota would not provide the income it could achieve on its own.

Under government pressure to become more in line of recent losses over its over all route situation, KLM again is helping. Negotiations with the other airlines have indicated that the carrier's quota would be little or no better than the one originally proposed.

Quotas established in 1959 and set to expire in government approval, but also consideration of the expected growth and development of Lufthansa and



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Europeans Face Crippling Stage Lengths

By Cecil Beeskov

Wreath—Most major European airlines, experiencing sharp rises in available capacity plus resultant fuel usage, defines crippling stage lengths, distances and low aircraft utilization rates, appear to be losing the profit battle along their respective continental route networks.

Hobbled by none of the its affecting U.S. domestic carriers as well as others largely averse to Europe, the airlines are being increasingly cramped by the introduction of large capacity jet aircraft that are difficult to rack economically into the relatively short haul intra-European route structure.

Passenger load factor on the intra-European routes of the member airlines of the Air Research Bureau is expected this year to dip slightly below the overheard 1960 figure of 64.7%, which, in itself, is about six points below the break-even level for the network as a whole.

ARL, the common research and statistical arm for 15 member carriers, estimates there will be a 2% increase in traffic over its sponsored intra-European routes this year. Most than all, setting this, however, is the fact that available capacity for the network is registering a 10% gain over the figure for 1961.

Short Miles Increasing

Seat sales offered on the intra-European routes by member ARL members have increased by more than seven fold over the past 10 years and are expected to jump from 7.7 billion in 1961 to approximately 5.7 billion this year. Passenger miles, in fact, are due to climb from last year's 4.16 billion to about 4.4 billion.

An ARL survey of the 1961 results of 10 of its member airlines shows a continued intra-European network loss

living upon transatlantic profits and government subsidies to tide in the slack.

Now, however, when transatlantic load factors also are matters of serious concern and the intra-European open routes are dipping deeper into the red, the losses accumulated on the Continental are being felt.

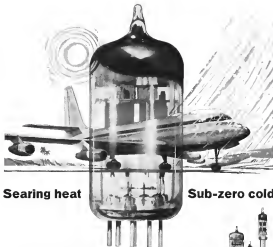
Combined ARL intra-European passenger load factor last averaged the 68% business mark in 1955, although it has not respectively rose in 1956 and 1957 before dipping to 55.4% during the 1958 economic recession. Although it was on the down-sloped until last year when overall traffic growth was outstripped by the quantity appearance of large capacity jet transports.

Rapid Switch to Jets

On the intra-European routes, the switch to jets has progressed rapidly. In 1960, jet aircraft accounted for 24% of the total seat mileage produced by ARL carriers. Now the figure stands at slightly over 32% pure jet plus another 25% turboprop. In 1961 ARL estimates on the basis of current and earlier pointed out that 35% of the member's intra-European traffic will be carried by jet aircraft and almost all the remaining 35% be turboprop.

In 1959, before the large-scale arrival, aircraft used on the intra-European routes generally averaged out to approximately 40 seats each. By 1961, the average per aircraft had climbed to 66 and experienced shrunken expect it to reach 75 within the next few years. As a consequence, the outlook for passenger aircraft appears bleak. One airline spokesman observes:

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Intra-European Passenger Growth

	Passenger millions	% Intra-European passenger growth	Passenger millions	% Intra-European passenger growth	Passenger millions	% Intra-European passenger growth
1962	1,745.3	15	1,664.9	26	10.4	
1963	2,024.3	16	1,891.9	31	227.0	
1964	2,723.6	34	2,499.9	17	303.7	
1965	3,264.2	40	2,841.9	35	406.1	
1966	3,648.9	12	3,194.3	12	445.4	
1967	4,209.3	15	3,536.0	10	473.3	
1968	4,910.0	16	3,779.9	67	554.4	
1969	5,411.6	10	4,161.7	10	579.8	
1969	4,484.3	10	3,764.1	10	419.8	
1967	3,764.4	10	3,179.9	10	584.5	

Figure through 1969 represent the totals of 12 member airlines of the Air Transport Forum including most of the major European carriers. Only a 1966 number for ABE is reflected in the 1966 comparison. (Note: European traffic is defined by ABE as that carried on routes originating and terminating within the geographical area covered by the European continent and the West Bank as far as the Persian Gulf. Strictly domestic traffic between is not included.)

ties and I didn't see any immediate prospects for improvement. Our capacity is going to be well above the traffic growth over the next few years.

The only way to ease the load factor would be underutilization of the aircraft, and so time is going to do that.

Growing at a constant rate of 14% a year, the actual percentage increase of passenger seats on the intra-European routes has been outstripping that of U.S. domestic trunk carriers by about 6% annually, but the present high rate structure for the airlines is acting in a sharp brake against any additional surge in traffic to meet the additional capacity now available.

Economic Growth

This percentage figure, most officials agree, largely represents Europe's overall economic development, which is now paving the way for the U.S. It also indicates that European airlines are well on a growth curve while American trunk carriers have reached the "maturity stage." The most growth pattern is reflected in the intercontinental and even the expansion of ABE routes, which passenger seats increases are averaging 17% a year as compared with 12% for the U.S. flag carrier.

At present, intra-European lines generally run about 10% higher than those charged for similar stage-length flights within the U.S., where, when demand is in excess of supply, although they tend to drop below this mark in areas where full competition is most acute. This high rate factor has opened a number of new lines, individual airline spokes, but for the most part, it has been the means of attracting new traffic to the growth needed to obtain acceptable passenger load factors.

As in the U.S., however, many carriers are looking at increasing scheduled flights in most carrier line year-to-year rather than decreasing. Perhaps significantly, Iberia, which registered a profit for its

intra-European operation last year declined to surpass the 1964 fare increase.

Iberia is an actively long stage lengths over most of its continental network. Operating from Spain into Central Europe and the United Kingdom, the carrier's stage lengths average out to approximately 600 air miles as opposed to the 1963 intra-European average of 554 air miles.

Stage Length Problems

Short stage lengths between points with a restricted traffic potential by large aircraft with ocean capables also act as a deterrent against any attempt to raise the frequency level on most intra-European routes; it is almost inevitable that offered on similar U.S. services.

Low frequency levels and the seasonal aspect of the intra-European traffic serve to limit the number of aircraft that can be scheduled. ABE specialists have estimated that 3,300 per year on aircraft such as the Sud Caravelle, the jet and Vickers Viscount 800 turboprop series is about the maximum that can be scheduled under present conditions. Introduction of large multi-engine jets into the intra-European market will provide intra-European airlines with still another source of income, but an obviously large increase in difficult-to-fill first class is possible. As long as European passenger load on a transatlantic flight is 75%, although it often drops well below this figure in the low water months.

On the other side of the coin, winter-month passenger load factors for tourist class often exceed the 60% mark despite the fact that approximately 60% of the total intra-European traffic is carried during the summer season.

Another factor contributing to the high operational costs of intra-European routes is the intercontinental aspect of the operation itself, which boasts charges by an estimated 25% over those for domestic flights because of added



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or increased fees for such items as catering, ground handling, maintenance and air traffic control services.

With the highfare structure, however, average revenue per passenger kilometer on the intra-European routes of AIRB members was 5 cents in 1961 as compared with 3.85 cents on the currently unregulated and overpriced flights—the more so that of U.S. scheduled airlines and about 4 cents on domestic segments.

Trend to Southern Europe

One encouraging sign for at least some of the airlines is the trend toward longer flights on the intra-European routes as airlines flying from Northern and Central Europe reduce more toward travel over the non-potential stop lengths to the Mediterranean area during the summer months.

While relations state between travel discounts the North European traffic picture, routine flights to Southern Europe and North Africa are increasing at a steady rate, and AIRB estimates that by 1973 half of the air traffic on the continent will be moving to or from this area.

European airlines also are paying renewed attention to their freight services, a fact ignored at least partially in the need to find uses for surplus passenger equipment with little outlet value. In this regard, the intra-European freight capacity has increased three fold over the past three years, and approximately 30% of the air cargo carried is now shipped aboard specially equipped for all-freighter operations.

Overall, however, with an average increase of flights over 50 cents per ton kilometer, freight still accounts for little more than 5% of the annual revenues collected from the intra-European network.

Pooling Considered

As a result of increasing over capacity with uncoordinated equipment, there are signs that the airlines will move closer together in coordinating and possibly pooling freight services within Europe.

As a first step, British European Airways and Deutsche Lufthansa are now planning a pool agreement built around BEA's recent acquisition of four Armstrong Whitworth Argosy turboprop aircraft. These aircraft are more than 60% the range and potential of the British carrier.

There probably will be other arrangements, similar to the BEA-Lufthansa agreement, encompassing both passenger and freight in the seasonal peak periods, and the presence of transatlantic pool made with the advent of the Common Market and other international cooperative agencies.

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Western Airlines Improve African Service

Washington—High density airline services operated throughout Africa by Western European flag carriers, coupled with intensified technical assistance programs, appears to be slowing down Russia's drive to gain a strong air transport foothold on that continent.

That is, Kania has attained notable success in northern and western Africa—particularly in Ghana, Mali and Guinea—in the establishment of air routes for Aeroflot and in developing cooperative agreements with several African nations (AW June 23, p. 38). But the extensive network of air routes operated by Western European air carriers and, more recently, those operated in cooperation with African networks is gradually diverting African attention from the Russian effort.

Both Western and Russian carriers now attribute their strong positions in African air operations to the high degree of dependency the Africans are forced to place on these more sophisticated airlines in an area where the rate of labor is extremely low and tribal customs still prevail, the pool of qualified personnel is limited, capital is sparse and technical training is one of a frustrating task that is a project.

European technical assistance programs in virtually every category of air line operations, from air control to the support of fledgling African flag carriers and into African air services in addition, the chief trade and commercial organizations of interest of Africa are robust but within Europe and most African nations, for one reason as another, are not equipped to service these long-range routes, although they have been making progress.

Preference for air routes within Africa is north and south with terminal points on the European continent and very few air routes cross the continent in an east-west direction. Routes from Africa to the Far East and to the Western Hemisphere are few. Flight frequency on all routes is scant.

African nations with interest in Guinea and Senegal have turned to the Russians for aid but these countries are in the minority and there are signs that dis-

enchastment with Soviet aid is growing. Mali, which received \$1.5 million in U.S. aid in 1961, reportedly is becoming disillusioned over having with the Soviet Union. Air Mali operates a fleet consisting largely of Russian-built aircraft, including four Il-18s, four Tupolev transports and de Havilland Doves for the Komsomol for the maintenance of regular service.

Ghana, with one of the highest totals of college graduates of all black African nations, is kept on the Red side of the fence by Kwame Nkrumah, who, last year, attracted \$190 million in aid from Russia compared with about \$12 million from the U.S.

Ghana's army is also less fallen into economic and technical dependency on Russia, but again there are signs that the current is concentrated with the Red effort, particularly with the eight Il-18s it operates. High operating costs and heavy maintenance problems are the principal complaints emanating from the airman's hand office.

Ghana Airways operates in addition to the Soviet planes, Bristol Britannia, Lockheed Constellation, Douglas DC-10 and has three Vickers Viscounts, three Vickers VC-10 turboprop transports and two Boeing 707 turboprop aircraft on order. Future plans are highly ambitious, include a projected fivefold increase in New York to London.

concentrated ties with the British are still firm and appear durable. Ghana Airways is not needed in Western Europe, not within the Soviet bloc.

Ghana has turned a cold shoulder to the West, exports farm products to the Communist bloc and has received an abundance of Soviet financial aid. Air Guinea operates two Il-18s and several Cessna 441s built Il-14 piston engine transports purchased by it by the Guinean government.

As Guinea relies on Czech technical aid for its operations and there are few indications that its efforts will be diverted from Red interests within the foreseeable future. Despite solid Marxist leanings, however, there are signs of discontent against Communist political interference by Guinean President Sekou Touré.

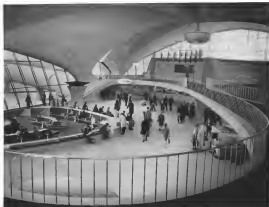
Elsewhere, Russian success in African airline operations have been mixed. Togo is shown as an intermediate point on Aeroflot's route may but there is no trace of regularly scheduled air service into or through that point by the Russians.

Aeroflot has publicly announced its intention to extend service from Belgrade to Cairo and the Sudan into the Malagasy Republic. Regular service between Moscow and Khartoum, capital of the Republic of the Sudan, has begun. But the key into Malagasy, which is vigorously anti-Red, has not yet been successfully opened to Aeroflot service.

Congo, who was the last port of call into Africa for the Communist bloc, attempted to make contacts in the Congo but were rebuffed by the Congolese military.

Nevertheless, Russian airline gains in Africa have been a source of concern to top level government officials of Western European nations and the U.S.

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de-developed African nations as well as to Communist infiltration and Western countries fear that such technical assistance programs introduced by the Russians will be used to undermine opportunities to indoctrinate African to Communist principles.

For example, 100 Russian technicians assigned to Ghana Airways, under a technical assistance program, are involved in providing flight paraphernalia as much as in developing an airline system. The U.S. and several European nations are attempting to counter that drive by providing equipment and technical assistance superior to that offered by the Russians.

In this respect, France has helped Air Afrique, a consortium airline representing 11 nations which were former French colonies, make great strides in the development of scheduled service and particularly in the establishment of airways and communication systems. Air Congo, led by the Belgians, operates one of the fastest domestic airline systems in Africa, it steadily replaces European with Chinese personnel in both the cockpit and on the ground and is planning to extend its routes into Europe early next year. Top Soviet efforts are still represented on Air Congo's management.

Secondary that U.S. holds is that Africa is now seeing the Russians as at spearhead for transatlantic service to the Western Hemisphere. Aeroflot has already explored the possibility of opening several South Atlantic routes from Africa to South America. The airport at Conakry, capital city of Guinea, was built with Russian funds and is described as the most modern in Africa. It was the launch field for the T-14 carrier flight to Havana, presumably, will be used for future planned flights across the Atlantic since the Russians have not yet been able to obtain transit rights from the South Americans to permit Aeroflot's use of the great carrier.



MAP SHOWS AIR ROUTES of Aeroflot in West Africa, first serviced last season on a T-14B jet power. Route with an E-15 subsonic transport. The month stopped at Tripoli where the two maps. Africa routes entered but the Russians do not designate Tripoli on the map, since agreement to serve Libya has not been reached.

CSA, Caraculouline, airline, is now operating regular service between Freetown and Harare. Aeroflot hopes to begin such service soon (AW July 30, p. 54). Cuba's Cubana Airlines wants to expand its international routes but the airline is hampered by equipment shortages.

It is no secret that the Russians are bitterly disappointed over their failure to reach an agreement with the U.S. on a New York-Moscow route. Russian officials have tried to American, where that has, hopefully, made the first gesture toward negotiating a bilateral agreement and are disappointed over the U.S. refusal to sign it.

Next point on Aeroflot's route ex-

pression program is Montreal and most international airline officials are convinced that this is just the beginning of more growth to come. This venture appears for now more positive, which has become evident last time in some ways is a part of Russia's drive for scientific cooperation throughout the world, desire for international prestige and a natural emergence of Aeroflot into a world wide carrier over all existing barriers were lifted by the Kremlin.

Aeroflot is a U.S. Civil Aeronautics Board Federal Aviation Agency Military Air Transport Service international airline domestic airline, a first service which had a certificate of international

1960-1961 Traffic Figures of African Carriers Reporting to ICAO

	Passenger Mileage		Passenger Mileage (1961)		Available Tonnage (1961)		Load Factor (%)		Aircraft Fleet (1961)		
	1960	1961	1960	1961	1960	1961	1960	1961	1960	1961	
Algeria	382,726	503,371	323,177	447,015	124,438	729,811	63	44	30,489	31,553	
Algeria-Air Lines	115,828	185,444	114,779	184,811	327,463	264,747	27	40	18,132	16,131	
Algeria-Airways	85,424	85,424	85,424	85,424	85,424	85,424	48	48	8,872	8,872	
Algeria-Airways	141,484	142,473	142,473	142,473	272,838	268,314	37	39	10,084	11,261	
South African Airways	402,830	364,438	441,813	488,541	1,341,372	1,326,428	22	39	24,627	26,194	
South African Airways	25,023	25,023	25,023	25,023	119,384	119,384	48	41	11,013	12,827	
Trans Air	81,214	81,214	81,214	81,214	72,622	109,708	103,026	44	71	3,410	3,410
United Arab Republics	247,318	247,318	247,318	247,318	104,724	276,726	368,549	49	34	24,416	25,143
United Arab Republics	145,479	145,479	145,479	145,479	145,479	145,479	145,479	48	75	12,441	12,441
West African Airways	26,018	27,048	18,246	14,322	77,612	20,704	44	66	8,508	1,953	

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for in such Pacific islands as Hawaii, Tahiti, Fiji and New Caledonia are being expanded steadily. Japan and Hong Kong have been particularly active in the construction of new hotels in recent years, and both Australia and New Zealand are promoting tourism heavily.

Philippine Air Lines last year carried 32,144 passengers on its international routes, an all-time high. The bilateral agreement with the U.S. was demonstrated in 1960 by the Philippine government after the airline had decided to restore its transpacific service, which it had dropped in 1953. The demonstration occurred as a result of a U.S. refusal to approve its capacity increases when the Philippines felt were required to ex-

press its flag carrier a fair share of the traffic between Manila and San Francisco.

Japan Air Lines, a major transpacific operator, has shown a steady increase in traffic on its international routes, reflecting the introduction of jet equipment enabling it to compete more effectively with Northwest and Pan American World Airways.

Load factor for the carrier in 1961 was 79.7%, a two-point drop from the 81.9% noted in 1960. This was due to a substantial increase in available seat kilometers—from 707 million in 1960 to 8.2 billion last year.

Pan American's Pacific Division generated 1.9 billion revenue passenger miles in 1962 compared with 1.5 billion

in 1960. Load factor fell to 66.8% in 1961 from 69.2% in 1960. Because of a strike in 1961, comparative figures of Northwest's Pacific operations are not available.

In the South Pacific, the French is dependent solely TAI has shown a steady increase since the introduction of Douglas DC-8 equipment and since it began the promotion of Tahiti as a stopover point between Sydney and Los Angeles. Qantas Empire Airways Australian carrier, has experienced similar traffic increase, but last month it unfortunately dropped its bid to serve Tahiti as a stopover with TAI. The only U.S. carrier now serving Tahiti is South Pacific Airlines, which operates a route between Honolulu and Espino.

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TRANS-CANADA AIR LINES  **AIR CANADA**

Merger Is Dominant Theme in U.K. Airlines

By Herbert J. Coleman

London-British air transport industry, still plagued by indecision in interpreting government policy, appears to be moving toward consolidation into three important airlines, two state-owned corporations and one independent.

Possibility now exists that within this decade the industry will be put in motion to weld the two state corporations—British Overseas Airways Corp and British European Airways—into a single airline.

Already, despite the fact that legislation was enacted last year to give the independent a larger share of the business (AW May 27, 1965, p. 36), the independent airline, held in disfavor by British United Airways. Two independent but just either discredited service or went into receivership.

Second largest independent, Caledonian Airways, has lost money for the past two years and recently entered into an agreement with BOAC to form a North Atlantic subsidiary (AW June 11, p. 41) that is still having preliminary negotiations. Caledonian Airways is in a merger plan with British United, but this never reached fruition.

Two Factors

At the moment, airline officials are concerned about two factors which will have prime importance in future planning. These are:

- Recommendations of a commission appointed by last BEA speech against award to independent of 22 airports for routes (AW Dec 4, p. 41).

- Warning by the Air Transport Licensing Board that it would demand solid proof of a firm financial base before awarding routes to applicants in the future.

Results of the BEA report (AW Jan 28, p. 49) should be made known shortly. Recommendations made by the commission, after a long series of hearings, have been given to John Acheson, new minister of aviation, who is currently studying them. Under the Civil Aviation Licensing Act, he holds veto power from which there is no appeal.

Most serious complaint in referring to the route awards is the long time lapse from the initial hearing board award, through the inevitable pattern of appeals by BOAC and BEA, until final decision by the minister. Planning, then, has become a shakier paper after subject to drastic revision when the road actually is in motion.

Forming of this British subject are forced to conduct, in effect two separate enterprises—one a normal operation of carrying routes and the other preparing for routes which could call for extra re-equipment decisions but which also may never be awarded.

Awards awarded after British United and Caledonian Eagle, but the final disposition by Acheson will be interpreted as indication of what the government's policy will be. It has been vague ever since Peter Thorneycroft, the then minister of aviation, awarded both an approach to independent and the Air Transport Licensing Board by driving Caledonian Eagle's North Atlantic route of its own.

Formation of a BOAC-Caledonian Eagle subsidiary to join the latter's two Boeing 707's on North Atlantic service, has resulted not only in a link between a state-owned corporation and a private enterprise, but also an operating from one to both sides.

That has been extremely attacked by both the Conservative and Labor Parties in Parliament. It probably will

come up for a full-scale debate this fall, mostly because Parliament session having been informed of what it considered a long shift in government economic policy in the case of the spring session.

Meanwhile, the powerful Trades Union Congress, the British Labor confederation, has been actively lobbying against the BOAC-Caledonian Eagle deal, and plans to raise its objections to Acheson before Parliament meets in October.

Remaining Independents

In the independent field, the airlines remaining after British United began a steady round of mergers, not for the most part small operations involving two and three airplanes, and existing as charter units to holiday centers. The largest recent casualty was Air Sahara with a fleet of 15 aircraft and the latest to go into receivership is Trans-European Airways, with three Lockheed 749 Constellation.

In its annual report issued recently, the board noted that the only conditions that it would take stringent measures to ensure proper financing before granting route licenses.

Board selected specifically to the do-

Scheduled Plane Miles in Turbine-Powered Aircraft (%)

First Six Months of 1962

Airline	Total	Turbine Jet	Turbine Prop	Turbine Gyro
Alitalia	120.0	100.0	—	—
Aeromexico	100.0	100.0	—	—
Continental	97.2	41.6	—	—
Eastern	95.3	—	—	—
Northwest	78.6	41.2	29.4	—
Western	76.9	34.8	—	—
Pan American	76.5	36.5	—	—
Trans-Canada	71.9	71.6	—	—
American	70.9	48.5	12.8	—
National	69.5	54.7	34.8	—
United	66.3	35.5	—	—
Alaska	47.4	—	—	—
Peapack	45.2	—	—	—
Midwest	41.6	34.7	—	—
the Central	37.7	—	27.2	—
West Coast	35.3	—	34.1	—
Eastern	30.7	—	75.0	—
Midwest	46.6	—	44.5	—
Pacific	45.2	—	—	—
Delta	42.4	—	—	—
South	40.7	35.3	77.6	—
Los Angeles	38.7	—	—	28.7
Waco Airways	36.4	—	38.5	—
Pacific Northwest	35.8	32.8	—	—
Grain	14.0	—	16.6	—
Albany	14.0	—	—	—
Helios Type	11.7	—	12.7	—
New York	—	—	—	4.8
Shuttle	—	—	—	—
Black	8.0	—	—	—

*Shuttle includes turbine equipment, but none are operated in scheduled service

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Montreal—Volume of international mail handled by the flag carriers of the world has shown a steady average increase of 15% since 1956, only slightly lower than the rate of growth of passenger and freight traffic during that period.

Although mail volume has declined in the past few years, proportion of mail revenue to total revenue has declined, a reflection of substantial reductions in mail rates paid by governments to its carriers. In 1958, an mail revenue accounted for 90% of total revenue, although mail represented less than 10% of total ton-mile traffic. Mail revenue in 1958 represented about 7.7% of total revenue and 7.2% of total traffic.

Average rate of payment received by international carriers of the world has dropped from about 90 cents per ton kilometer in 1953 to 44 cents in 1958, a 40% decline.

case of 10 British independents, noting that in some cases financial weakness was caused by suspension of operations. The report added:

"Against this background we felt it desirable to postpone discussion on a number of applications made to us which we were disposed to grant.

If we had postponed a thorough investigation into the financial positions of certain companies, business may have been granted for services which the carrier was unable to render or render and the traveling public would have been inconvenienced as, in a few cases, they was in 1951."

Board complained that in a number of applications, the absence of audited or authenticated financial records was a major handicap and delayed final decisions.

In an examination of financial backgrounds of the independent airlines, the board found that "though there are no serious exceptions, many of the companies are in our view grossly undercapitalized in relation to the scale of their operations."

Most of the firms searched none of which were identified appeared to operate through "intellectual plan having, for loans from directors and shareholders or third parties, or by restricted delay in payment to creditors, including government departments, according to the board.

Thus, looking to 1963, the board said it will not normally grant licenses to operators who do not submit accurately up-to-date records.

In addition, the board emphasized its feeling that the capacity of working capital of any air operator should normally be provided by share capital issued for cash or its equivalent and that loans and outstanding debts should arise only



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a small part of the company's financial resources.

Regarding resources to the independent airline business, the board said it will expect adequate seed capital from the start, directly related to the scale of operations. Other requirements will be to forward estimates of capital and revenue, including provisions for taxes, depreciation and fleet replacement and a workable system of costing. Problems obviously does not apply to British United, which has a solid financial base spread through old-line shipping companies. It has secured an assured support on its finances and earnings (AWW Dec. 4, p. 89) which reinforced its net profit of \$1,285,908.

It is doubtful that British United will incur a repeat on its 1961 operations this year, due primarily to the likelihood of its newly merged lines and because of a complicated series of labor negotiations and under way with unions are companies under British United.

However, the company said that in 1961 it carried nearly 2 million passengers, more than 95,000 tons of freight, and about 120,000 automobiles on its channel airway services, giving some indication of its revenue-generating ability.

The airline now has over 160 airplanes in its combined fleet, and has four Vickers VC10 transports, and 10 BAC 111 transports on order.

British United thus appears to be one of the few British airlines to make money. BOAC losses will be about \$30 million when the airline orders its annual report early in October. BEA losses were closed up by plowing its reserve funds.

It is because of these heavy losses that speculation on a closer tie-up between the two corporations has soared. It is known that there is strong monthly support for such a move, even to the point of actual merger and something less than endorsement by it at top echelons of BEA and BOAC. At one time, it would take an act of Parliament to accomplish a merger.

Chances are that if such a move ever came to pass, it would be placed into working order over a long period, starting with merger of the rules between the two airlines, and perhaps, out by months, negotiators would discuss the duplication in the de Havilland Comet fleet engineering and aircraft service services.

At the competition level, the current dispute between the two airlines would be largely irrelevant. These also would be complex policy changes in day-to-day operations, since BOAC is geared for long haul operations as an instrument of British national prestige. BEA is the short-range to medium-range airline in the United Kingdom and Europe, and the management philosophies of the two companies are geared to this.

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By Edith Waldron

Geneva—Major East European airlines are looking toward the West, including South America, for potential route expansion and possible new equipment purchases while accelerating frequencies along some of their established services and extending their Soviet bloc networks.

Some operators who are continuing their determined bid to capture a share of the passenger and cargo markets in the Near East and the traffic potential in several newly independent African states.

USA Commercial Airlines was the first Commercial line airline to penetrate the Western Hemisphere with the introduction of Bristol Britannia jet, linking service only this line between Prague and Helsinki via Shannon, Ireland and Cardiff, Newfoundland.

four Vickers VC10 fourjet airliners during the 1961-65 period for its private charter airline, the *Anglo-American Airways* (AAV) Ltd. (2, p. 177). And in 1965, the airline was sold to the British Overseas Airways Corp. (BOAC), which was then officially an establishment of a member of the U.N. It is a top priority project in order to cater to the approximately 10 million Americans of Polish descent, a number of whose ancestors had ties with relatives still residing in Poland.

FAT planned its long expected order for three M-8 and S-8 Caravelles under this selling to coincide with the opening of its new international Warszawa

British Engagement

LOTE, which recently purchased three Viking Viscount 800 turboprop transports from British United Airways hopes to establish a transatlantic route within the 1983-85 period possibly with long range jet equipment of British origin.

JAT Yugoslav Airlines Aerotransport will operate Sad Casaville M4 medium-range jet transports over most of its West European routes by next February, while MALEV Hungarian Air Transport is planning to place its first medium-range jet aircraft on service on a new route to Africa and additional points on its Near Eastern network by 1974-75. MALEV has yet to announce its choice of aircraft.

Thus far, CSA Czechoslovak Airlines, the largest of the East European carriers, is the only one among those to operate pure jet equipment. It has five Soviet Tu-104s, two jets in service in addition to its Russian-built Il-18 for baggage and Il-14 and L-2 piston aircraft, the workhorses of most other Communist bloc airlines. In stark con-

CBA's steadily growing operations, the carrier also is pushing ahead with a redevelopment and modernization program for Papeete-Fare Airport, its home base, scheduled for completion by 1985. First additions to the airport's existing buildings were a new control tower and modern administration and baggage facilities. Work is now continuing on the extension and modernization of technical installations and construction of new

four Markers VC-10 freight trailers during the 1991-95 period for its proposed transatlantic route operation (A/E #12, p. 173). Airtel from the U.S. Coast Guard to the U.S. officials an estimate of a network to the U.S. is a top priority project in order to cater to the approximately 10 million Americans of Polish descent, a number of whom are expected to be involved in the reuniting in Poland.

JAT placed its long expected order for three ML-6 Super Caravelles only this spring to coincide with the opening of its new international terminals at Katowice, the largest city in the center of Poland. Development of the airport project began in 1958. Total estimated cost is \$2.5 billion. Regular flights to the Yugoslav center's oxidized and Impulse Center Airport base situated 2.5 mi. from Katowice, Katowice, Katowice covers 700 acres.

Essential Aircraft

According to MALEY's Technical Director, Iurii Nizov, the two engines are being developed at the Central Aerohydrodynamic Institute of aerodynamic Research TsAGI, and will be constructed between 85 and 64 per cent throttle depending upon configuration (static lift) among four different jet transport types under study for medium-range operations within the 1984-85 period. Also under consideration is the projected Soviet B42, which is scheduled for service by late 1984 or early 1985. Forward by four new mounted (inboard) engines, the B42 is now under development by the Rybinsk design group (AVM No. 79, p. 42).

MALEY also has two other four-engine aircraft in the works: the 100-seat Vukhan V-10 and the 120-seat Vukhan V-120. The latter is being developed by the Vukhan design group (VAG-11) at Irkutsk on the basis of two four-engine configurations.

However, the need to strengthen screening and firm maintenance costs of any modern aircraft by eliminating duplicate workshops may, in some degree at least, reduce a number of scheduled orders within the Eastern bloc to place orders for chemical equipment.

At least three East European airlines already are taking steps to pool the servicing and maintenance activities for their respective IJ18s, with each carrier sharing the load in accordance with its available workhours and labor

For example, LOT will be responsible for servicing and maintenance of the B-55 navigation equipment. MALEV for servicing of the engine system and CSA for powerplant instrument maintenance. Advantages of this procedure were demonstrated during its recent test period, according to a MALEV spokesman, and it probably will be applied to any new domestic aircraft purchased in sufficient quantity by these three carriers at least.

Like those of the other major East European airlines, CSA's operational results continue to show a steady, if somewhat slow, growth. Last year, total net sales flown were 35,481,630 as compared with 30,217,123 in 1966. Total number of passengers carried by CSA in 1968 was 799,261 as opposed to 751,840 the previous year.

• **Deenewerk roadtrip** service is reported on Feb. 5 between Prague and Havana with a 54-passenger Breda Betanides leased for an exclusive period from Calmar Compañia de Aviones.

• **Prague-Denpasar** service via Sofia and Ankara was begun Feb. 15. Along with it, Prague-Baghdad via Athens and Damascus service introduced on June 1960. Damascus is served on a twice-a-week round trip basis.

Essential Aircraft

According to MALEY's Technical Director, Iurii Nizov, the two engines are being developed at the Central Aerohydrodynamic Institute of aerodynamic Research TsAGI, and will be constructed between 85 and 64 per cent throttle depending upon configuration (static lift) among four different jet transport types under study for medium-range operations within the 1984-85 period. Also under consideration is the projected Soviet B42, which is scheduled for service by late 1984 or early 1985. Forward by four new mounted (inboard) engines, the B42 is now under development by the Rybinsk design group (AVM No. 79, p. 42).

MALEY also has two other four-engine aircraft in the works: the 100-seat Vukhan V-10 and the 120-seat Vukhan V-120. The latter is being developed by the Vukhan design group (VAG-11) at Irkutsk on the basis of two four-engine configurations.

However, the need to strengthen screening and firm maintenance costs of any modern aircraft by eliminating duplicate workshops may, in some degree at least, reduce a number of scheduled orders within the Eastern bloc to place orders for chemical equipment.

At least three East European airlines already are taking steps to pool the servicing and maintenance activities for their respective IJ18s, with each carrier sharing the load in accordance with its available workhours and labor

The Czech airline also has made progress in its new-scheduled air transport service since its introduction in June 1951. With its fleet of multi-engine light aircraft, L-708 Libanor, Aero 42s and L-601s, plus some Soviet Antonov-2s and Czech-built IEC 2s along with R-10s, Mi-1 and Mi-6 helicopters, 78 pilots are now being serviced from 11 air bases located at strategic points throughout Czechoslovakia.

From a total of 291,579 ton miles flown in 1951 when CBA's domestic network served only 17 routes, total ton mileage by the end of 1964 was approximately 1.3 million. Total passengers carried in 1951 were 5,802 while, by 1965 (1965 and 1961, a total of 150,000 passengers were transported for a mean of approximately 25,000 per year. CBA says it now scheduled operations as centered for next two 631,000 ton miles during the first seven months of the year with corresponding increases in passengers and cargo.

Despite persistent difficulties with supply, outdated equipment and limited technical facilities, LOT Polish Airlines also has registered slight gains in its operational results in recent years.

From 2,702,980 ton rails flown, 113,176 passengers and 3,358 U S ton. of freight carried in 1951, total ton miles flown in 1951 were 9 754 855 passengers (members) 203,662, and freight, 8 093 U S tons. For the first six months of this year LDT reports that 101 900 passengers and 2 439 tons of cargo were carried over its route structure.

Including two new direct Wireless Zurich Port and Wansu Australian London round trip services introduced during the 1991/92 winter season, ELP's network now covers a distance of 10,342 unduplicated route miles, with its domestic miles accounting for 1,321 ms of the total. Its national network consists of such air routes which because of their close proximity, are not economical, and the company plans no further expansion in this area until demand is sufficient to warrant the investment.

JAT operates into Amsterdam, which operates both to US and Russian markets. Equipment is concentrated in the passenger segment, in the share of the air traffic market in Europe in line with capacity in some cases of boosting the country's much needed trade and tourism. First step along with the completion of Romsdena Kona Airport, was a firm order for the three Comorcs. With these, JAT plans to introduce its first jet services over its Belgrade-Athens, Belgrade-Cairo, Belgrade-Moscow, Belgrade-Paris/JFK, Belgrade-Zurich, Belgrade-London, Belgrade-Rome and Belgrade-Tokyo network. Inauguration of these three routes is planned for the

Restricted access and shortages of skilled workers continue to represent the carrier's main problems, but it is over-



HAIYU HUNGARIAN, L. LE SOVIET TRANSPORT AT BUDAPEST

among these sufficient, to render the goal set program viable in its operational results in recent years.

From a total of 9,000 international and 51,000 domestic passengers carried in 1992, passengers transported by JAL in 1990—latest firm figures available—reached 57,300 for its international and 160,000 for its domestic network.

Tugalis' carrier's Douglas DC 3 and Roman 314 aircraft serve its domestic routes over 26 different schedules from 12 different airports throughout the country. Only seven of these airports, however, are maintained on a year-round basis. The remaining five can be used only during the summer season although improved airports and airport facilities at some of these will soon allow them to be included in the airline's year-round flight schedule.

INT says there is no demand there for her as the season is Tagelima, but during the peak tourist season the

cancer does operate occasional charter flights to Rome, Cairo and Casablanca, for example, as well as to Warsaw, Budapest, Sofia, Bucharest, Kiev and Moscow with Boeing 744s, Douglas DC-6Bs and B-70s.

MALEV Hagerstrand Air Transport's 1982 summer flight schedule includes a total of 21 international round-trip flights a week each, with a new one-week round-trip D-15 airshiping option between Budapest and Helsinki introduced on June 5, includes services to 19 centers in East and West Europe. Pending the outcome of present bilateral negotiations, MALEV plans to establish a new, probably twice-a-week service to Athens, the last major link still missing in its West European route structure, upon delivery of its fourth IL-86.

Much of Elongon's agricultural produce, especially seasonal fruit and vegetable, is distributed by air throughout the country, and accounts for a good share of MALEV's growing domestic operations. Its national routes are operated from seven airports located near industrial centers of the country, all of which are served throughout the year on a regular twice-a-day basis—each morning and afternoon.

MALEV. The LDT Polish Airlines does not include an ambulance or agricultural mission in its operations; the Hungarian Ministry of Health being responsible for the former work, the Ministry of Agriculture carries out all assignments connected with pest control and crop diseases.

MALRU's fleet is based at Hungary's only international airport, Ferihegy, located 9.5 km from the center of Budapest. Its single 10,686-ft-long runway is large enough to accommodate the present volume of passenger and aircraft traffic although should the service, there is ample room for expansion.



LOT POLISH AIRLINES' 26-passenger B-14 preparing for takeoff at Warsaw-Okęcie Airport. One of LOT's fleet B-15 turboprop aircraft can be seen in background. Inland a British Francome Airways' Valiant Viscount.



AVIANCA AIRLINE OF COLOMBIA BOEING 739B

South America Beset by Over-Competition

By Ward Wright

Main problem facing international carriers operating in Latin America is excessive competition—directly causing losses to several all carriers in the area—and protectionism through capacity restrictions.

Nearly 70 airlines compete in Latin America today where some operated in 1945. Forty-three carriers fly between the U.S. and Latin America, 32 of them foreign carriers, the remainder U.S.

Disembarked U.S. carriers have encountered increasing difficulty in Latin America. Higher labor, provisioning, and maintenance costs combined with the expense of new equipment and a declining percentage of the U.S.-Latin American trade market—from 61% in 1957 to 49% in 1961—have caused operating losses every year since the U.S. carriers were off schedule in the mid-1950s.

Lowfare carriers using fully depreciated piston equipment still carry loads of the tourist business that might travel on U.S. airlines.

Compounding U.S. carrier problems in Latin America is the threat of capacity restriction through frequency control or a quota on the number of seats that can be sold on given routes.

Several Latin American governments, pursuing their own national interests, have at times imposed capacity restrictions on U.S. and other foreign carriers. Presently only two nations—Argentina and Venezuela—impose capacity restrictions on any U.S. carrier.

The Argentine government has imposed both freedom traffic—traffic to or from one country carrier between two other countries—restrictions on all foreign carriers operating between Argentina and adjacent countries. Under Argentine regional traffic plan, 75% of the traffic between Argentina and any

of its neighbors is reserved for the Argentine carrier and the carrier of the respective country. The remaining 25% can be split among the other foreign carriers.

Pan American World Airways requested permission to extend via San Francisco-Sao Paulo, Brazil flights to Buenos Aires but has been turned down. Another request, extension of two weekly Pan American New York-Buenos Aires flights to Montevideo with a waiver of all local traffic rights between the two cities was also denied.

In Venezuela, Pan American used to have daily piston service between Miami and Caracas. With jet equipment Pan American has been limited to three flights weekly.

Both Viana and Pan American want to increase scheduling between their respective countries but Venezuela won't part with concessions and she has rejected same in return. One airline—Viana seeks in the schedule of New Orleans to a terminal on its Caracas-Miami route. Now the carrier has to operate separate flights between Caracas and New Orleans in conjunction with Delta Air Lines.

Brazil recently imposed capacity restrictions on several European carriers operating over the highly congested South Atlantic route between Europe

and South America. Brazil has, however, recently lifted capacity restrictions against Pan American.

After somewhat notice that it was terminating the bilateral agreements with The Netherlands, the Scandinavian countries and Switzerland, Brazil canceled the 40% freedom traffic rights of KLM, SAS and Swire. The carrier was designed to receive a larger share of the traffic for Penair do Brasil, The Brazilian South African carrier.

The three airlines had just completed overhauls to jet aircraft when they also got their schedules cut from three piston flights weekly to one jet flight. Off the three carriers, Swire is the only one to have reached an agreement with Brazil.

The carrier now has a bilateral agreement providing two Convair 440 flights weekly on its route between Stockholm and Rio de Janeiro via Lisbon and Dakar. KLM and SAS are negotiating with Brazil in an effort to ease the restrictions.

In spite of these examples, U.S. officials are hopeful that the philosophy of protectionism via capacity restriction is not as expanding as recently, several signs point to a reversal of a trend toward more restriction in several Latin American countries.

One sign is the success a past Civil Aeronautics Board Study. Departmental has led job in persuading Chile to drop capacity restrictions that would have affected U.S. carriers.

Chilean plan would have limited foreign carrier—including U.S.—to one-third of the traffic between Chile and her neighbors. The plan, in



BRASILIAN VARIG AIRBUS CARAVELLE AT BRASILIA

have become effective last month, would have given the dominance of through flights over Chilean territory to the number of flights a foreign carrier scheduled in and out of Santiago each week.

The French would have allowed carriers offering three weekly flights coming and going to Santiago a total of one overflight, five flights in and out of Santiago would have allowed two overflights, eight Santiago flights would represent their overflight.

Chilean Restraining

Chilean plan stemmed from the announced intent to protect its own airline—LAN-Chile—from its present state of development and to ensure that foreign airlines did not bypass Santiago on flights over Chilean territory.

What "protection" the CAB-State Department has used in not known, but it is understood that Chile was told that restrictive action could lead to LAN's leaving its New York authority. Recently, there are indications that Ecuador, Peru and Colombia will not follow through with amended capacity restrictions permitted after the Chilean plan.

Another sign U.S. officials regard as hopeful is outlined in a memorandum made by the CLAC 3 (Conférence Régionale de l'Aviation Civile) meeting of government aviation officials in Bogotá last February. The memorandum states that in 1964 in a future's airline passes the developmental stage, capacity restrictions should be gradually eliminated.

U.S. which does not recognize the right of any nation to restrict capacity with which we have a bilateral agreement, give a negative vote along with an expression of sympathy for the policy.

Opinion is divided on whether the CAB should be empowered to negotiate against carriers of countries that impose restrictions on U.S. airlines.

In general, U.S. international airlines favor giving CAB power to negotiate capacity that foreign carriers operate to the U.S. both at a competitive and a minimum amount against countries that restrict U.S. carriers.

Two steps in this direction have been taken so far. One, CAB's Foreign Air Carrier Permit Travel Investigation, was begun in January, 1962, to determine whether foreign air carrier permits should be extended to require the filing

of traffic data, schedules for approval, and equipment information as demanded by the Board.

Board would then be able to approve or disapprove of such schedules with all designated schedules to be drawn toward within 30 days without hearing.

CAB Executive Edward T. Rodda found the problem to be one for Congress and the President in his recommendations. However, he carefully traced the history of restrictions of one sort and the country's traditional opposition to it in his decision. One is still before CAB. Another attempt to regulate foreign air carrier capacity is a bill now before the Transportation and Aeronautics Subcommittee of the House Interstate and Foreign Commerce Committee which would authorize CAB to require foreign air carriers to file schedules for approval.

Carrier Thinking

Carrier thinking in government circles is that restrictions don't solve the problem of dealing with countries which impose capacity controls. As one State Department official put it: "Restriction does the door in a traffic market—there is no magic solution." It



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helicopter.

Participation to the project and construction of the main mechanical components for the S.E. 3210 "Super
Prelux" helicopter.

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disasters are the U. S. will continue
to rely on persuasion and negotiation
to solve the capacity restriction prob-
lem. (See p. 151.)

In recognition of the difficulties fac-
ing the low U. S. passenger carriers
which serve South America, CAB as-
signed the U. S. South America Route
Case on Aug. 5, 1981.

The proceeding is the first major
legislative review of the whole Latin
America route structure since 1945.
CAB is considering the case with the
intentions of creating a modernized
route structure along each coast of
South America with a link in Buenos
Aires. U. S. companies would be
forced by east and west coast gate-
ways.

Carrier Selection

After the case phase is completed,
CAB will turn to the problem of
selecting a carrier to operate the
routes. A carrier not selected would
have its Latin American authority re-
voked. At the time it was proposed,
the routes of Caribbean routes and
carriers will be discussed before the
case is completed.

CAB's hope is that one of two U. S.
carriers operating over a standard
route system organization of seven U. S.
gateways will be able to compete
effectively despite higher operating costs
and intense competition from Latin
carriers.

Traffic growth, jet equipment and a
10% reduction in economies have over-
laid existing two years ago among
International Air Transport Association
member airlines operating in Latin America
have caused the means of competition
with low-fare independent airlines using
jetliners.

Cost-Este Factors

In spite of the various IATA fare
levels adopted by international air-
lines in the Western Hemisphere in
force since June, 1981, outside fare
practices among member IATA and non-
IATA carriers continue to tip the
scales of the Latin American air trans-
port industry.

Passenger trucking logistical costs
will have a wide phase of fare and ser-
vices available from both IATA and
non-IATA carriers. Between Man-
agua

U. S.-South American Air Traffic

Passengers and mail in U. S. by air from South America	Year	All Flaps	U. S. Flaps	Passenger Flaps
1961	1961	1961	1961	1961
1962	1962	1962	1962	1962
1963	1963	1963	1963	1963
1964	1964	1964	1964	1964
1965	1965	1965	1965	1965
1966	1966	1966	1966	1966
1967	1967	1967	1967	1967
1968	1968	1968	1968	1968
1969	1969	1969	1969	1969
1970	1970	1970	1970	1970
1971	1971	1971	1971	1971
1972	1972	1972	1972	1972
1973	1973	1973	1973	1973
1974	1974	1974	1974	1974
1975	1975	1975	1975	1975
1976	1976	1976	1976	1976
1977	1977	1977	1977	1977
1978	1978	1978	1978	1978
1979	1979	1979	1979	1979
1980	1980	1980	1980	1980
1981	1981	1981	1981	1981
1982	1982	1982	1982	1982
1983	1983	1983	1983	1983
1984	1984	1984	1984	1984
1985	1985	1985	1985	1985
1986	1986	1986	1986	1986
1987	1987	1987	1987	1987
1988	1988	1988	1988	1988
1989	1989	1989	1989	1989
1990	1990	1990	1990	1990
1991	1991	1991	1991	1991
1992	1992	1992	1992	1992
1993	1993	1993	1993	1993
1994	1994	1994	1994	1994
1995	1995	1995	1995	1995
1996	1996	1996	1996	1996
1997	1997	1997	1997	1997
1998	1998	1998	1998	1998
1999	1999	1999	1999	1999
2000	2000	2000	2000	2000
2001	2001	2001	2001	2001
2002	2002	2002	2002	2002
2003	2003	2003	2003	2003
2004	2004	2004	2004	2004
2005	2005	2005	2005	2005
2006	2006	2006	2006	2006
2007	2007	2007	2007	2007
2008	2008	2008	2008	2008
2009	2009	2009	2009	2009
2010	2010	2010	2010	2010
2011	2011	2011	2011	2011
2012	2012	2012	2012	2012
2013	2013	2013	2013	2013
2014	2014	2014	2014	2014
2015	2015	2015	2015	2015
2016	2016	2016	2016	2016
2017	2017	2017	2017	2017
2018	2018	2018	2018	2018
2019	2019	2019	2019	2019
2020	2020	2020	2020	2020
2021	2021	2021	2021	2021
2022	2022	2022	2022	2022
2023	2023	2023	2023	2023
2024	2024	2024	2024	2024
2025	2025	2025	2025	2025
2026	2026	2026	2026	2026
2027	2027	2027	2027	2027
2028	2028	2028	2028	2028
2029	2029	2029	2029	2029
2030	2030	2030	2030	2030

and Buenos Aires economies face in one
of Brazil's airlines' prices higher in \$274
one way, and \$492 round trip. Pan
American, which operates only jet air-
craft on the route, charges \$143 one
way, \$286 round trip and \$518 round trip
American Peninsula (APSA) and Aero
lineas INT of Argentina, a non-IATA
and an IATA carrier respectively, each
charge \$219 one way and \$518
round trip for jetliners.

INX, one of a small group of IATA
carriers using older equipment, is per-
mitted to match the low fares of inde-
pendent carriers without violating
IATA agreements.

In general, frequent customer ser-
vice jet equipment and in some cases
revenue are the main reasons why car-
riers trade, trying to adhere to the
higher IATA fares have been able to
survive.

Business Passengers

Carriers equipped with jets have
found that most passengers who travel
to fly at the lowest fare available when
all carriers had jetliners equipment are
willing to pay the extra cost to avoid
a long piston flight. This is particu-
larly true of business passengers, the
bulk of the U. S. traffic flowing into
Latin America.

Operation maintaining price adhe-
sion along with jets have been helped
enormously by the low IATA economies
lines in holding their own with the
non-IATA independent carriers who charge
jetliners. These jet carriers
continue to phase out their piston ser-
vices wherever traffic growth warrants
and airport facilities in Latin America
prevent introduction of jet service.

Low-fare independent operators will
do a thriving account and plans have
been business-friendly South Ameri-
can traffic that is flowing north and
returning.

The main difference between the
rate rates of the 1970s and the 1980s
the carriers face existing practices of to
do, is that in many parts of Latin
America there is a mixture of fare ad-
hering and those in the part of IATA
and non-IATA. In some cases, it is
seen to be an open air situation—over
while working at local "passenger"
fare positions.

Over profits, not as widespread
throughout Latin America as it once
was, is crucial again back to the
business. This problem is still a major
problem to U. S. carriers in Argentina
and Brazil. U. S. carriers, who are far
less likely to do as best as Civil Aero-
nautics Board regulations and air-
line loss claim such practices have
been their competitors.

Some travel agents for certain air-
lines will get "promotional" commis-
sions as high as 10% and rebate as
much as needed to ensure a commission
to fly on a particular airline. Even
though the fare was sold at the stand-
ard IATA rate, the practice gives the
carrier, particularly one with lower
operating costs, a competitive ad-
vantage.

Auditor further also a problem in
Argentina and Brazil is fare cutting at
a non-standard or "black" exchange
rates in which local carriers
are losing sales rapidly, airlines and travel
agents have road exchange rates a month
or more old to give a competitive ad-
vantage.

An example would be if 1,300 units
of local currency means north \$1 this
week, the fare in U. S. dollars would be
the same—only the exchange rate would
be the old rate of 700 units of local
currency per \$1. A customer would
naturally pay the same fare in U. S.
dollars while saving 300 units of local
currency.

While rate cutting will occur, the
overall picture of fare practices in Latin
America is one of slow improvement,

U. S. Carriers Pretax Earnings in Latin America

Pan Am	Delta	Boeing	Passenger
Latin America	Latin America	Latin America	Latin America
1961	1961	1961	1961
1962	1962	1962	1962
1963	1963	1963	1963
1964	1964	1964	1964
1965	1965	1965	1965
1966	1966	1966	1966
1967	1967	1967	1967
1968	1968	1968	1968
1969	1969	1969	1969
1970	1970	1970	1970
1971	1971	1971	1971
1972	1972	1972	1972
1973	1973	1973	1973
1974	1974	1974	1974
1975	1975	1975	1975
1976	1976	1976	1976
1977	1977	1977	1977
1978	1978	1978	1978
1979	1979	1979	1979
1980	1980	1980	1980
1981	1981	1981	1981
1982	1982	1982	1982
1983	1983	1983	1983
1984	1984	1984	1984
1985	1985	1985	1985
1986	1986	1986	1986
1987	1987	1987	1987
1988	1988	1988	1988
1989	1989	1989	1989
1990	1990	1990	1990
1991	1991	1991	1991
1992	1992	1992	1992
1993	1993	1993	1993
1994	1994	1994	1994
1995	1995	1995	1995
1996	1996	1996	1996
1997	1997	1997	1997
1998	1998	1998	1998
1999	1999	1999	1999
2000	2000	2000	2000
2001	2001	2001	2001
2002	2002	2002	2002
2003	2003	2003	2003
2004	2004	2004	2004
2005	2005	2005	2005
2006	2006	2006	2006
2007	2007	2007	2007
2008	2008	2008	2008
2009	2009	2009	2009
2010	2010	2010	2010
2011	2011	2011	2011
2012	2012	2012	2012
2013	2013	2013	2013
2014	2014	2014	2014
2015	2015	2015	2015
2016	2016	2016	2016
2017	2017	2017	2017
2018	2018	2018	2018
2019	2019	2019	2019
2020	2020	2020	2020
2021	2021	2021	2021
2022	2022	2022	2022
2023	2023	2023	2023
2024	2024	2024	2024
2025	2025	2025	2025
2026	2026	2026	2026
2027	2027	2027	2027
2028	2028	2028	2028
2029	2029	2029	2029
2030	2030	2030	2030

*Includes 100% TVA in Federal territory.

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and increasing governmental awareness of the need for fare stability.

Most airline officers questioned about progress toward fare stability give IATA credit for what has been achieved so far.

There has been accomplished despite dissidents at IATA's own table who are opposed to short fare stability and enforcement.

Bermuda Meeting

Plans for Western Hemisphere IATA routes were adopted with difficulty at the 1953 Bermuda meeting. At that time carriers were reluctant to adopt a rigid fare structure that would not allow sufficient leeway to meet marketing competition from non-IATA low-fare companies.

A limited budget, shortage of enforcement personnel and indifference of local governments kept IATA from effectively policing its own rules. By 1955 cut-rate fare practices, aggravated by intense competition from non-IATA carriers, had begun to erode the Latin American fare structure badly.

By 1955 the situation was so bad that, as one Latin American airline officer put it, "the fare was usually what was in your pocket."

Fare Review

At the 1958 Cannes meeting, IATA carriers reviewed the fare problem and adopted an escape clause allowing them to drop their fares 10% below the lowest non-IATA competitor if permitted by competition.

That move by the carriers was largely an implied threat to low-fare carriers that the IATA group could undercut them legally if it had to.

With no solution in sight, the Brazilian government called the first regional conference of government aviation officials in January 1959, at Rio de Janeiro.

The conference, called CRAC I, recommended that equal fares and rates be applied for comparable services. But neither recommendation permitting carriers designated by their own governments as underdeveloped to charge a maximum of 10% less than the standard IATA fare unified the stabilizing effect of the first recommendation of the conference.

As a result of another CRAC I recommendation, a meeting between 28 IATA and 13 non-IATA members with government observers was held in Lima in March, 1959, to try to work out a series of agreements.

The agreements were to be based on CRAC I recommendations.

The result of the Lima meeting was a shift dominant emphasis, underdeveloped services—services with obsolete or undersupplied equipment—instead of underdeveloped carriers as a



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GENERAL ELECTRIC



laws for a 10% fare differential with IATA curfew.

Another article of the Latin draft document requested governments to enforcement of air transportation agreements among themselves without setting up machinery to do so. The Latin draft was vetoed by TAN airlines of Honduras and LAN of Chile.

In spite of its flaws and occasional defect, IATA regarded the Latin document as a useful basis for future negotiations and proof that there was hope for a workable agreement among carriers.

IATA members met in September, 1959, at El Salvador to work out a final structure for Latin America to become effective on April 1, 1960. The meeting revealed the escape clause of the 1958 Caracas meeting allowing carriers to drop from 30% below the lowest fare of non-IATA competitors and adopted northbound directional instant fares.

The Havana meeting also notified governments and carriers that if non-IATA low-fare carriers did not accept the principle of equal fares and rates for comparable services, the April 1 fare structure would not go into effect.

No improvement was apparent and the rate situation remained open. The IATA curfew came again, this time in Caracas in October, 1960. After signs that the open rate situation was beginning to hurt the low-fare carriers and that the fare might be favorable for a workable fare agreement, IATA changed its strategy.

Instead of trying to adopt a rigid fare structure and attempting to enforce it, it was decided to cancel hundreds of special excursion fares, drop the excursion fare 10%, raise the first class fare 10% and take a closer look

at equipment differences as a basis for fare differentials.

IATA's purpose was to make a fare structure flexible enough that all carriers could compete effectively.

Effect of the Caracas proposals was CRAC 2 held on October, 1960, at Montevideo. CRAC 2 recommended governments meet and enforce the fare levels worked out at Lima and approved in Honolulu until Mar. 31, 1961, and renounce of the 10% fare differential for carriers offering water developed services.

In the meantime, governments were to enforce the Caracas fare with an

eye toward approval by Apr. 8, 1961. CRAC 2 also recommended that governments adopt necessary measures to ensure whatever rates were approved by effectively reduced.

The Caracas fare levels were notified by a traffic noticeboard filed in Bermuda in 1960, approved by all governments and became effective June 1, 1961, to apply through Mar. 31, 1963, thereby ending the open rate situation.

Since then, IATA has strengthened its enforcement staff in Latin America, which has resulted in marked reduction in fare cutting—mainly in countries on the West Coast of South America.



LYCOMING'S T53 FUEL NOZZLE

Future of Turboprops

Orders for turboprop transports declined drastically in 1961, but there are signs that interest in dual-shaft turboprop transports by air carriers of the world will increase during the next few years.

While Korea continues to test its highly-publicized Taepo-115, Evchen 115 and Andromeda 115 turboprop transports—arguably, about 250 aircraft in American civil aviation fleet of 150 planes—production of large turboprop aircraft has virtually ceased in the western world.

At the end of 1958, 526 turboprop transports had been delivered but during the year, only 56 new orders were placed. For turboprop engines: About 100% of these was for the short-haul Fokker Friendship and Aero 745. A few Boreal Bratslav and Volyn Vozokh were appearing on the second-hand market last year.

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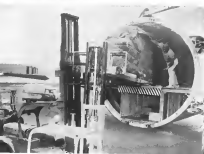
perience in large scale manufacturing of the intricate and precise parts that make up a fuel nozzle; and experience in controlling the quality and performance of these devices on a mass scale.

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LUFTHANSA LEASES SPACE ON MAILORD WORLD CL-44S



SWISSAIR DC-8 UNLOADS AT ZURICH

North Atlantic

By James R. Ashlock

New York—Contrasting the in North Atlantic air cargo volumes is continuing strong in the industry that a boom, though it is under way.

Air cargo men optimistically feel that their business will grow the year that it is a vital increase among several of more situations with more the most passenger-conscious airlines.

Last year, 340,764,148 lb of cargo were flown between the U. S. and Europe, 364 1/2 million tons in 1960. This year it rose another 53% the first six months, and may top 49% before year's end.

Each of the first six months, except April, are increases averaging 55% and even April's 16.7% showing was made up for by a 43% jump in May. Air cargo is providing as much as 30% of total revenues on some airlines' transatlantic schedules. During the passenger off-season, cargo has been credited with 43% of revenues on some flights.

Air cargo advocates say the figures prove that freight can provide a smooth revenue flow throughout the year, unlike the seasonal peaks and valleys of the passenger business. The revenue will increase, they emphasize, since air cargo is entering its best season of the year. Heavy commercial emphasis on fall and Christmas buying always brings in new cargoes of U. S. and European products.

New developments that cargo men in some of the larger airlines stress with pride is how, with their freighters and the belly-bulk of jets, they are providing faster service than the carrier's highest premium service—the first class passenger section.

One airline sold \$3,160,990 more cargo space than it did in the same time the first six months of this year as in the same time last year. And cargo officials at other airlines matching this performance say they could make more for their airlines through the year by getting 34,000 lb of cargo in the space devoted to first class.

"Naturally, as volume can't give up first class," says cargo vice president and But judging from year-around loads, they might as well say to offer it on every flight in the winter season.

"Now of our scheduled jets now depart at night, the time when cargo moves. We're filling up the 15,000 lb of available space in the belly, and often have to hold shipments for later flights. It rarely would be able to have 20,000 lb of extra cargo space on those airplanes."

Airline action has followed cargo contracts—the Douglas DC-3F, Boeing 707C, Canadian CL-44 and the new

Air Cargo Volume Shows Large Increase

dash-range Argon—are evidence of cargo's growing impact on the industry. For the first time in air cargo's international career, which as a practical sense dates back only to World War 2, the business has planes that can make a profit on acceptable shipping rates.

Direct operating and overhead costs on 74000 lb payload piston planes like the DC-7 and Constellation, converted from passenger to cargo use, run as high as 85 cents a ton mile. The CL-44 dropped that to 11 cents based on 10 lb daily utilization and 70% load factor, and provided 62,000 lb of lift. The DC-3F and 707C will reduce it further to 10-11 cents a ton mile with the bonus of 58,000 lb payload plus higher utilization through jet speed and quarter turnaround.

CL-44 for shows Flying Tiger with 10 and negotiating for four more; Scandinavian with seven. Back with four BOAC is close to an order for two Trans-Canada has ordered four DC-5Fs and Trans International, a contract carrier, is buying one. Pan American will receive two 740Cs next year, and World Airways, another contract carrier, will also receive two.

If the present looks good for air cargo, the future appears brighter. All most everything about the U. S. and European economies, particularly the prospect of the Canadian Market, is viewed as a forecast of air cargo expansion.

"There's no reason for worrying but optimism right now about the prospects for the future of air cargo," said S. C. Darling, vice president of cargo for Trans World Airlines.

Darling believes, and many of his colleagues agree, that the rising purchasing power of Europeans will stimulate demand for U. S. products. The Common Market will give added impetus to the already growing buying ability of individual Europeans. Darling said that even if the world economy takes an unlikely dip, air cargo should be profitable since shippers then must seek faster service, heavier overweights and broader markets without incurring even all costs.

Specialized terminals, like the \$2,000,000 facility at Zurich and the new City facility, are being built exclusively for air cargo. As with passenger terminals, opinion differs as how much terminals should be designed.

"Naturally, most of us think, like World has the best arrangement," a U. S. carrier cargo official said. "Each carrier operating there has its own cargo building."

At City and Kléber (Zurich) there's too much mixing of the shippers' freight in by various carriers. And the national airline always receives the most



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Output	1000	1000	1000	1000	1000
Power	1000	1000	1000	1000	1000
Weight	1000	1000	1000	1000	1000
Size	1000	1000	1000	1000	1000
Price	1000	1000	1000	1000	1000

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consideration as to space and location within the transport.

In spite of equal requirements in strength, transport and the business value, many problems persist for air cargo. Its advocates feel themselves engaged in a dual selling role. On one hand, they are struggling to expand their markets; to convert shippers of air's advantages into surface transportation.

And on the other, they must convert their own assumptions that air cargo is worthy of large investments in manpower and equipment.

Tradition an Obstacle

Part of these is no simple obstacle. The world's products industries have been raised on ground or water. Today, only one-fifth of one per cent of all cargo moves by air.

"Too many of industry's traffic managers still view air cargo as an emergency measure, to be used in unusual turn-up situations," says Wilfred Gormery, U.S. cargo sales manager for British Overseas Airways Corp.

Supporters of Germany's new upstart airway of traffic managers look no further than the shipping cost when evaluating air freight against surface. Getting there to analyze it in terms of reduced warehousing, less pilferage, lower insurance premiums, better customer service and lower transportation through factory-to-warehouse distribution is a difficult task.

Air cargo men cite many examples of markets they're trying to open. They refer to certain European export manufacturers who appear unduly satisfied with the lower cost of water shipment from Europe to New York.

Servies Unappreciated

"They don't seem to realize the sizable expense of moving those machines in throughout the U.S. from New York, even though we've illustrated how they could save by flying directly to major U.S. cities by air, one white spokesman said.

A specific firm often angled out as a prime potential for air cargo is Volkswagen, the German automobile manufacturer. To save U.S. dollars, Volkswagen ships mostly by surface. It maintains a 1-month inventory in a Long Island warehouse, the storage costing approximately \$250,000 a month.

"We've told them they could reduce that to a four-month inventory, save up to \$500,000 each quarter, and provide better service to their dealers by using air freight," one air carrier spokesman said.

"But they stick to surface transportation."

On the other hand, Renault, maker of French cars, has used air cargo exten-

sively. Critics like to credit this with Renault's maintaining a strong U.S. competitive position in spite of Detroit's economy car line.

Despite their frustration, air cargo men realize the position company distribution managers are in. Any firm's foreign department is content if annual shipping costs don't go up as inflation tolls. But it would be hard to question any transportation with higher air cargo rates. And the traffic manager is less lost or doesn't want to be lost, to be and convince his superiors that savings can be realized which more than make up for the higher rates.

If cargo has one outstanding defect, it's the passenger business, it is the manner in which it is marketed. Shippers, rather than being interested in flow, are truly concerned with dollars. The air cargo salesman generally has to know in much about his specific industry as the dealer about his dealer's ability to serve it.

Speakers Needed

We really need something more than sales representatives," said one of them. "It takes a specialized man, one of account executive caliber, to sell traffic to new business for air cargo," he said.

But as one of the speakers' counterparts puts it, most airline managers aren't willing to incur the added expense of skilled sales personnel for air cargo.

"To understand this, look first at the background of most airline executives," one cargo vice president said. "They're sons of the air, trained from the beginning people that products. Consequently, their attention is toward passengers instead of cargo."

This is a factor generally cited as why many airline officials tend to ignore, or at least tolerate, air transport's visible losses in passenger service, while being outright upset at proportionate deficits in air cargo. More than one airline's management agrees with air cargo executives that there is enough space on the passenger plane to satisfy a freight operation without freighters.

Freighters Endorse Operations

Some, the freighters have been losing money, although they stand a good chance to pay their way this year," another spokesman said. "But management must realize that the freighter moved out our former profits, and at least a lot of the business that we can earn on jobs. Although the freighter, and our jet cargo loads suffer as well."

While among carriers these are the air shipping line, cargo losses fully backed by big management. Pan Am, for example, emphasized by its order for two 747C jet freighters, BOAC, its mother, Sir Matthew Slattery, chairman



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CHARACTERISTICS	Resolution (volts/rev)	40
	Frequency (Hz)	400
	True-RMS Voltage (V)	10
	Max. ERM (mV)	2 (loaded)
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Part Number	323-001A
CHARACTERISTICS	Number of inputs
	Impedance (ohms)
	Yield (dB)
	Phase shift (degrees)
	Gain (dB)
	Operating Temp. Range (°C)

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of the board, going cargo has public endorsement. Air France field personnel have had disaster from top level to begin steering cargo into, and both have a seriously exploding cargo to obtain CLHs for a more aggressive freight effort.

The internal problem isn't solved simply by obtaining management backing, however," a cargo official said. "It often results in one field manager having to decide first between passenger and cargo units, with cargo usually getting the short end."

Alitalia

Frank Tanno, North America cargo sales manager for Alitalia, was convinced passenger-cargo sales representative to good advantage, evidenced by Alitalia's 25% rise this year in tonne-metric cargo volume.

"Alitalia isn't concentrating on development of new business in the U.S.," Tanno said.

Presently, he is seeing a larger share of the existing market, "according to Tanno.

Tanno said that once he obtains construction on shippers already using air cargo, they don't have to be the market development specialists desired by most cargo lines. They just sit to all Alitalia.

"This is the only practical way for us," Tanno said. "We don't have the time or the sales manpower to spend on days, even weeks, of developing one new account."

He admits, however, that there must be an occasional market development program as a hedge against the day when air cargo's annual growth pattern, like that of the passenger business, begins tapering off.

"Market development should be a cooperative effort by all the airlines," he said. "Air France should take responsibility for development in France, Lufthansa in Germany, BOAC in England, Alitalia in Italy, Pan Am, TWA and Seaboard in the U.S. and so on among all carriers."

"That way, all points would receive concentrated attention, the overall market would be developed, and there should be a satisfactory share for everyone."

Pan American

The opposite extreme of Alitalia's position is Pan Am's World-Wide Navigation Service, which the carrier says is the first international advisory service established by an airline. Pan Am says that in the first half of 1962, its representatives handled more than 1,000 American businessmen in developing new markets abroad.

Seaboard World Airlines agrees with Pan Am that shippers should be as

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ated by the carrier in finding new outlets. John H. Mahoney, senior vice president of sales, says that while a U.S. businessman feels he can't rely abroad for lack of a market, then Sea Board begins seeking one for the lost business.

"We in Seaboard are fast believers in package arrangements," Mahoney said. "Take for example the shipping of strawberries' personal effects from Europe. This amounts to millions of pounds a year, and it has always moved by water."

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Seaboard worked out a special rate scale, determined by whichever U.S. state the shipment goes to. Then we provide a lightweight container, which the soldier picks himself. Last, we pick it up at his European domicile and deliver it to any port he desires in the U.S. This business today accounts for nearly 60 per cent of Seaboard's Europe 100% toll."

Mahoney feels that package arrangements like this, adaptable to a wide range of commodities, will draw more shippers to air cargo. Others agree, evidenced by Pan Am and TWA widening use of container and arrangements with trucking agencies for door-to-door delivery.

As an all-cargo operator, Seaboard relies heavily on military and mail traffic. On the average, three of its five daily one-way flights across the Atlantic carry mostly military consignments. Pan Am and TWA likewise count on military and mail volume.

Foreign Lines Inked

The U.S. government uses American flag carriers almost exclusively for the shipment of military cargo and mail, a fact that has proven enticing to foreign carriers.

"If we had to rely on military cargo and mail like the U.S. carries it, we'd be out of business fast," says foreign carrier spokesmen. "But we do think the U.S. government should use the national carriers which best serve the foreign destinations."

American use of spot among foreign carriers for the U.S. military creates complaints about the reliability of service through American carriers. They become particularly upset at delays that money spent with foreign carriers contributes to the United States' outboard gold flow.

"We have much more in the U.S. through airfares and equipment purchases, than we can hope to take out," says Bill Nash of KLM's U.S. cargo office.

One thing the foreign carriers know, and the U.S. airlines realize also, is that so long as overseas airfares continue to exert billions of dollars in planes built

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by U. S. manufacturers, there isn't much chance that this country's government will restrict their operations here.

But two issues—rates and efficiency—stimulate the further inter-carrier exchanges behind the closed doors of each year's International Air Transport Assn. conference.

Disagreement on Rates

Seldom do any two carriers agree on how rates should be established, much less what the specific rate should be. Last September, IATA's transatlantic cargo rates were lowered. Some carriers went to lower them again, while others chose to hold the line. At the September meetings last year, the controversy will continue.

There's no real pattern to the two factions. Both have large and small operations in Europe. Both have members who have received an ordered new rate-line flight. One says air freight is a service worthy of present rates. The other not only lowered rates will respond the reverse.

"The final result is usually the same," one cargo official said. "The members in the best shape are held back until the late-entrants can make up equipment rate."

The search for a simplified rate structure within IATA is like seeking gold beneath a rainbow. The extreme diversity of international exchange makes it so.

"Transatlantic cargo rates are like a barrel, the whole part being Europe," one spokesman said. "European traffic goes into different containers, each with different business practices, different currencies, and all of these together producing such a variety of products that you can't count them."

Nevertheless, all this is pouring into one nation: the U. S. How do you derive a single rate structure satisfactory to all these markets, and all the carriers serving them?

'Open Rates' Proposal

This problem has stirred talk of "open rates," whereby each carrier would be free to determine the rates that best suit its operations. The Dutch, for instance, think this is in keeping with the free enterprise system.

"But there's no such thing as an open rate," a U. S. cargo official argues. "We tried it once, and look what happened."

"The foreign carrier determines what



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Model 18E1-A—100 watts output.—Substantially being used in long-range service for commercial radio with aircraft beyond the optical horizon. Frequency range 118-135 mc. Can be completely remote controlled by using AEROCOM's remote control equipment. AC loading from three phase by means of cable. Power requirements 115-240 V 60/50 cycles, single phase.

Model VM-200—200 watts output.—In range 118-135 mc. Designed for both ground-to-air and ground-to-air communication. Press-to-talk and audio input may be inserted using output pair of telephone lines. Power requirements 105-107V 50/60 cycles. Also available for air-to-air 135 mc. output drops gradually to 150 watts at 145 mc.

Model VM-50—50 watts output.—Frequency range 118-135 mc. Outstanding low power transmitter for ground-to-air service. With remote control provision, multi-power model with 100 ft. cable length. Delivered on casting for ground-to-air service—otherwise fitted with coil winding. Power requirements 118/200 V 50/60 cycles.

Model 60 VHF Receiver.—A high performance, low noise, single channel crystal controlled, single converter VHF receiver. Frequency range 0.001 to 135 mc. with twin crystal 0.001 to 135 mc. Frequency is measured as better than 1 part in 100,000 with 100 ft. cable length in noise free standard laboratory conditions. 30 to 40 db. audio output available. Spurious response down 50 db. Frequency range 118-135 mc. Power requirements 115-240 V 50/60 cycles. Also available for ground-to-air 135 mc. output drops gradually to 150 watts at 145 mc.



As in all AEROCOM products, the quality and workmanship of this VHF equipment is of the highest. All components are conservatively rated. Replacement parts are always available for all AEROCOM equipment.

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his rate will be able to country. If you operate there, his government won't let you charge a rate lower than that of the national airline. So you come up with a rate for each country you enter, and you aren't getting that rate."

A major reason that U.S. carriers say they don't have open rates is that the U.S. government would not hold foreign airlines to American air carrier rates.

"We asked the CAB about it once," a U.S. cargo official said. "They told us they had no jurisdiction in this area, and that they weren't sure whether or not any foreign agency did."

IATA Rates Collected

More than one airline cynically maintains that IATA rates mean little or nothing. Many say that Richard M. Jackson, president of Seaboard, was right in his remarks last May before the Second Annual Conference of Air Transportation at New York University.

"A substantial part of today's costs exceed air cargo is not covered at the IATA approved rates," Jackson said. "The so-called cheating is underestimating the approved rates is a day-to-day occurrence with most IATA airlines—probably all. Whenever a system is consistently violated, it is probable that the system does not suit the needs of the people for whom it was created."

A rate president at one of the three largest U.S. cargo carriers said he is becoming increasingly reluctant to develop new shipping accounts.

"No wonder do I get an airman served up this once foreign carrier, offering rate discounts and low rates for the traffic manager and his wife, come on and think it from me," he said.

The respondent in a major foreign carrier felt such charges are exaggerated. But he admits that there is a substantial difference in business practices and philosophies on either side of the Atlantic.

Different Sales Techniques

"You must remember that what is viewed as unethical in the U.S. is often considered good sales technique in Europe," he said.

"Another thing is that the American carrier always seem to want greater tonnage, assurance of a set amount of business throughout the year," he added. "Our airline, and others in Europe, simply stand ready to carry any shipment, no volume, in any port at any time. We feel that whatever amount of business we get is determined by how much we can sell."

Shores of IATA rates and rules are more difficult to prove in cargo than in the passenger business. "We'll find information is easy to change. Shippers

have been distributed or concealed when the charge arose, making proper impossible. And IATA itself is limited to fines and expulsion threats for enforcement. Consequently, such carriers seldom advance beyond the brief charges and counter-charges at each year's conference.

Cargo Situation

Delivered carrier roundup indicates the cargo situation through the first half of the year.

• **Air France** increased its combined volume 75% the first part of the year, capturing 5.5% of the total tonnage according to Paul Ginn of U.S.

cargo office. It uses Canalization flights, and is enjoying strong bookings from ship arrangements for cargo development.

• **Alitalia** is one of the newer arrivals with all-cargo flights, flying three times a week from Rome to New York with DC-7Cs. In 1961 it flew 24 million lb. of cargo in the first six months, and last that with the heavy volume volume approaching it could attain 6,000,000 lb. this year. Alitalia's cargo officials do not favor an additional rate cut.

• **BOAC** flew two DC-7F round trips a week, and is up about 18% in vol-



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#13460 UNDERWING REFUELING NOZZLE

LIGHTWEIGHT. Aluminum. Weighs 19 lbs. Interior metal parts are of non-corrosive stainless steel or aluminum bronze.

FOOLPROOF. New interlock mechanism prevents shut flow 'til nozzle is locked to aircraft adapter. Must be closed before nozzle can be removed.

FAST. Turret to engage. Push lever just 90° to lock on. Delivers 600 gpm. with pressure drop of less than 3 psi.

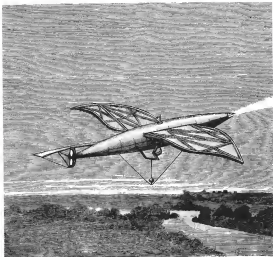
SELF-ADJUSTING. Prevents leakage without manual adjustments.

SIMPLIFIED. Maximum of moving parts and seals. All critical parts are accessible without complete disassembly of valve. Available with "free-venting" inlet adapter or plain threaded inlet.

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Nickel-containing alloys would have helped...

give this steam-driven "Maid" a better chance of getting off the ground even back in the 18th century.

But, like many of yesterday's ideas, this aircraft was conceived in an age that lacked the machines, methods, and materials to make it a reality. Today, transforming visionary designs into practical, high-per-

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For that alloy—a lot of others requiring extraordinary combinations of thermal, mechanical, elec-

trical, and chemical properties—look to alloys containing Nickel. We'll be happy to send you, without obligation, engineering data to help you select the best material for specific aerospace applications. Just write to Inco Application Engineering, outlining your requirements.

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since this year, its shipments consist largely of electronic products, and it is considering sales service through Philadelphia to cover part of the growing volume of scientific and industrial products shipped down there. KLMC offers further sales solutions.

• KLM met its volume in up this year, although it doesn't match the 35% industry average. KLM attributes this to a failure to increase its left column, apparently with its competitors. It has proposed a DC-3F purchase, but funds aren't available now. KLM has looked at the CL-44, but won't order it, being dissatisfied with the aircraft's cargo limitations. The airline thinks cargo rates can and should be lowered for market expansion.

• Lufthansa's volume, cost and weight combined, went up 45% in the last few months of the year. Jang V. Parrow, North America cargo manager, credits Lufthansa's special cargo arrangement on Seaboard's CL-44s with aiding the volume growth. The airline has 23,000 lb of space, about a third of the aircraft's capacity, on its weekly Seaboard flights. It has entered its Con. Airlines freighter. Parrow said the contract with Seaboard gives Lufthansa a special advantage: latest week-bound departure from West Germany at night. The facts that to get down into the petrochemical market, rates must be lowered.

• Pan American flew almost 100 million cargo tons under its system the first six months, increasing its cargo volume 13%, and it expects to reach 200,000 tons under that year. To Europe and the Middle East from the U.S., ton mile volumes were up 61%. Pan Am feels that cargo operations will ultimately fall down to only carriers operating both passenger and cargo schedules, since this provides the service pattern shippers desire.

• Seaboard broke the profit barrier, after four years of deficits, in May this year with a \$12,600 net, but made money each month since. It operates seven CL-44s with five transatlantic flights daily. Its sales effort is being directed toward developing shippers, those who provide a steady flow of business throughout the year rather than scattered consignments. Military contracts, increasing commercial business and a management reorganization are credited with giving Seaboard new stability. Seaboard also thinks added business will come more rapidly with reduced rates.

• TWA reports volume growth of up to 50%. It received its weekly Constellation flighter suspension to Europe this summer from Dec. 10 to flight No. 47 freighter orders are likely soon on view at TWA's financial outlook. TWA is among those favoring reduction of present rates.

High flow at 5,000 PSI

pneumatic solenoid valve for aero-space vehicles

THE new Valcor solenoid valve, Series 307, was developed and is currently being qualified especially for the aero-space industry's new Super 3000s, where high operating pressures, combined with extreme temperature variations, must be controlled... exactly!

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Airport Landing, Navigation Charges Soar

By Robert H. Cook

Washington—International airlines are searching anxiously for a more equitable formula of world-wide landing and air navigation fee charges, which they fear is in present uncontrolled form is producing increasingly head-on costs.

Gravity of the airlines' problem at the present and those concern for the future is underscored in a recent International Civil Aviation Organization position which estimates that the industry paid \$202.9 million in these combined user charges last year at the same time as it showed a net operating loss of \$140 million. In 1960, the ICADO balance sheet showed the user charges total of \$399.3 million was more than double the industry's \$70 million operating profit.

While the total dollar sum of the expense now stands at only 3.9% of the industry's projected 1960 operating revenues of some \$5.7 billion, the reason behind the current state of affairs is entirely out of proportion to the industry's past earnings record and threatens to become even more unbalanced in the future.

Only four years ago user charges totaling \$91.3 million represented 2.3% of the world carriers' operating revenues of \$13.9 billion. A breakdown of this expense shows \$112 million for airport charges and \$6.1 million for air navigation charges. The industry recorded a \$61 million operating loss that year.

By 1960 the cost of airport charges, including such items as landing fees, ramp rentals, and rental fees for counter space and hangars, increased 69.7%. Air navigation charges, covering astronomical and communications services, far exceeded this rate with an increase of 141% over the 1957 base. Last year the charges continued their steady upward climb, despite the fact that

international traffic growth, hampered by the problem of over-capacity and continued unrest in the world, was in the second year of decline and registered a gain of only \$4.6% in comparison with 14.9% for 1959. Airport charges for 1960 were up 25% above those of the previous year and air navigation charges were increased 56%.

Large scale, seasonal operations at many major international ports was affected last year by increased landing charges of 80% at Sydney, Australia; 47% at Paris, France; and 51% at London, England over 1959. Objecting to the British increase, the International Air Transport Association noted that the London fee increased an estimated 210% in four years.

Carriers estimate that if all other major airports also raised the same 134% increase in the most recent British rate, it would cost the air navigation airlines an extra \$39 million per year in landing fees. Germany also has raised its landing fees for international flights 35% and it is estimated

that carriers across the country will pay an additional \$5 million a year.

An overnight charge levied by the various countries present which may feel may be an even more onerous threat to the industry's financial health. In 1955, there were only 14 countries and 18 dependencies imposing these charges, as compared with the present total of 35 countries and 10 dependencies. It is generally considered that many other countries will adopt similar charges.

Recent developments in the United Kingdom and Africa lead particular evidence to industry from that air navigation charges as a source of government revenue are being spread throughout the world much faster than expected. In August, of last year, the United Kingdom announced that it would impose a system of air route charges for its navigation facilities in 1961 or 1962 on a fee basis designed to eventually recover the entire cost of operating these services from the airline industry. This could lead to similar action by other major European countries.

In Africa, a new constitutional system, Air France, has been formed by France and 11 of its former African territories (see p. 71). The independent states of Cameroon, Central African Republic, Congo Republic, Ivory Coast, Dahomey, Guinea, Upper Volta, Mauritania, Niger, Senegal and Chad have each negotiated 5% of the new carrier's capitalization of \$2 million. An estimated 14% ownership in Air Afrique is held by Air France and UAT (Union Aeronautique de Transport) which have been providing the bulk of aircraft to the territories. Two other former French territories, Guinea and Mali, declined to join the consortium.

France and these new states, plus Madagascar, have also formed a special agency for air safety control known as ASERCA. Current arrangements for ASERCA's operation, however, in French possession and operation of all necessary technical facilities and the absorption of 90% of the annual cost. Last January the agency announced that the 19% cost borne by the new African states would be reduced by implementing a system of user charges. International carriers operating over ASERCA territory estimate air route charges for each flight will exceed \$500.

Since an item has been indicated that the present ASERCA working agreement will be revised in the future to provide for even greater cost participation by the African states, there is a deep concern among the airlines over just how high ASERCA may raise its charges.

Representative Boeing 707 Landing and Related Charges

January 1959 and June 1961

COUNTRY & AIRPORT	Landing Charges				Related Charges			
	Jan. 1959		June 1961		% Increase		% Increase	
	Dep. (10-4-5)	Night (10-4-5)	Day (10-4-5)	Night (10-4-5)	Jan. 1959 (10-4-5)	Jan. 1961 (10-4-5)	Jan. 1959 (10-4-5)	June 1961 over Jan. 1959
Australia Sydney	318.40	318.40	370.00	370.00	30.0	30.0		
Canada Montreal	483.74	483.74	483.50	483.50	-4.0	-4.0		
France Paris	300.18	337.31	384.14	373.34	47.0	44.0	107.00	280.00
Germany All Airports	150.10	150.10	170.41	167.41	5	5		7
India Bombay	1137.00	1137.00	120.25	120.25	0	0		
Italy Rome	70.00	140.00	50.00	140.00	0	0	100.00	100.00
Japan Tokyo	200.10	200.10	200.00	200.00	-0.5	-0.5		
Netherlands All Airports	170.00	112.10	112.10	114.00	3.0	2.0		
Sweden Stockholm	10.00	120.00	30.00	30.00	0	0		
Switzerland All Airports	213.70	213.70	213.70	213.70	0	0		
Union of South Africa All Airports	200.00	200.00	200.00	200.00	-0.5	-0.5		
United Kingdom London	274.00	274.00	272.04	272.04	41.0	40.0	40.00	90.00
United States New York Heard Chicago (Midway) San Francisco	100.00	100.00	100.00	100.00	0	0	100.00	100.00
USSR Moscow	210.00	210.00	210.00	210.00	0	0	100.00	100.00

In addition, it is considered probable that other African nations may soon the agency's levy as an ideal method of raising revenues for their own transport and might also gain working agreements with ASERCA, in the future.

Defending its position ASERCA points out that it is entitled to levy the user charge as a contracting state under Article 15 of the Chicago Convention, and that early Sudan and Kenya imposed such charges for overflight and air navigation services prior to the formation of ASERCA. Overflight charges for a distance of 300 mi. on a Boeing 707 flight are about \$45 per flight at Kenya and \$14 at Sudan.

It is primarily on the basis of the high volume of overflight by international carriers that ASERCA makes its case for a user charge. The agency con-

siders that more than half the air route assistance it must provide is supplied by the overflights of international jet flights which provide no economic benefits to the member countries of ASERCA.

So far, the United States has succeeded in remaining aloof from this controversy but any decision by the government to impose a domestic user charge system at least to set an example, might be an encouraging example for other nations who have hesitated over this revenue-generating method in the past, the industry contends. In previous ICAO conferences the U.S. discussed plans for a domestic user charge, but explained that more study on international charges is needed before they would be considered by an agreement. The ICAO document, the U.S. explained, is that

adoption of these charges might have a serious impact on U.S. flag carriers and could accelerate a world-wide trend toward international route facility charges.

Unless the debate trend toward more and higher charges can either be reversed or halted most airlines contend that fares will have to be sharply increased to offset this expense rise. An attendant danger in the problem is that contribution of the public will force many carriers to seek advice and effort to encourage their operations at the expense of safety.

As this trend the industry is hopeful that the recent ICAO meeting in Rome will result in a concerted action by all member governments to settle the issue on an equitable basis. Delegation to the meeting urged that negoti-

Impact of User Charges on Airlines

(In 97 Contracting States of ICADO)

Millions U.S. Dollars

Domestic and International Operations	1957	1960	1961
	(\$)	(\$)	(\$)
Airport Charges	82.0	104.6	100.0
Air Navigation Charges	6.1	14.7	15.1
Total User Charges	88.1	119.3	115.1
Operating Revenues	3,071	3,400	3,470
Operating Expenses	4,012	5,330	5,400
Operating Profit (Loss)	(1,040)	(1,929)	(2,030)
User Charges as % of Operating Revenues	2.9	3.5	3.3



Flight Propulsion NEWS

A report on research and development in the Flight Propulsion Division of the General Electric Company



G-E Breakthrough in Electron Beam Welding Simplifies Fabrication

CINCINNATI, Ohio—General Electric engineers at the Flight Propulsion Division have developed a method of electron beam welding on the atmosphere which can be applied to large, heat resistant materials and metal parts.

The new G-E method involves using a constricting flow of inert gas which completely surrounds the weld cavity—a shielding technique that eliminates the vacuum needed in conventional electron beam welding. Until now, the biggest single disadvantage of EBW has been creating and maintaining the vacuum in a high vacuum.

G-E's new method, besides cutting cost by eliminating the vacuum, allows the use of EBW to parts larger than could previously be welded.

Electron beam welding is a recent advancement in metals technology which provides many advantages over ordinary welding processes. It is particularly attractive for welding critical space age materials resistant to ordinary high-temperature welding techniques.

Development work on the new electron beam inert gas shielding is underway at General Electric's Large Jet Engine Department under U.S. Air Force sponsorship. Meanwhile the technique is being incorporated into applicable fabrication phases in G-E's turbo-propulsion systems and related areas.



The 70-ton U.S. Commerce shipmover over Long Island Sound at a top speed of 57 knots recently during her first sea trials. The development hydrofoil vessel was built for the U.S. Maritime Administration by Brownian Aircraft Engineering Corporation and is powered by a 14,800-shp-class General Electric LM1250 turboshaft engine. A smaller 1900-shp turboshaft, the G-E LM130, is used for low-speed harbor maneuvering when the ship is not full-throttle. First commercial application is planned for 1963 when the Davies will carry tourists between Florida and the Bahamas.

Harmon Trophies Awarded B-58, T-3B Pilots

NEW YORK—Two American aviators were awarded 1962 Harmon International Aviation Trophies on August 12 for outstanding feats performed in General Electric-powered jet aircraft.

They were USAF Lt. Col. William B. Payne, responsible last year for flying the General Dynamics-built USAF B-58 bomber over two transatlantic records, and world record-setting jet-propelled aircraft pilot Joseph Cockburn.

Miss Cockburn's compelling suit for her own established "world class" flight

records while flying the Northrop T-38 supersonic trainer.

A third award, the Harmon Aerospace Trophy, was won by USN LCDR V. A. D. Koss and the late USN LCDR V. A. D. Koss for their record-breaking 1961 balloon flight that reached 114,744 feet over the Gulf of Mexico.

The three Harmon Trophies, presented annually since 1945 by the President of the United States, are presented "American Aviators for outstanding international achievements in aeronautics."

Colonel Payne, winner of the Harmon Aviation's Award, was responsible for two international speed records set in May, 1961. One flight covered the 2633 statute miles between Washington and Paris in 3 hrs., 25 min., 59 sec. for an average speed of 2048.68 mph, the other covered between New York and Paris (3581 statute miles) in 3 hrs., 10 min., to average 1839.38 mph.

The B-58 bomber, which is powered by four G-E J79 engines, also holds several international speed records. Former record holder Joseph Cockburn won record winner of the 1962 Harmon Aerospace Trophy for coupling low speed, low altitude, and two altitude records while flying the G-E J85-powered Northrop T-38 jet trainer.

According to the National Aeronautics Administration, Miss Cockburn's eight record flights, begun last year between August 24 and October 12, constituted "the largest number of international record flights made by any pilot in the world in so short a time."

Significant among Miss Cockburn's records were a straight line distance record of 1,652.29 miles, a 15,735 foot/sec. straight-away speed of 214.36 mph, and a sustained altitude record of 53,373 feet.

G-E CJ610's to Power West German HFB-320 Business Jet Aircraft

LYNN, Mass.—Two General Electric CJ610 turboprops have been selected to power Handlung's Flugzeugbau's recently announced HFB-320 executive jet.

Described as a 7- to 11-place aircraft, the HFB-320 is expected to have military and feeder-line potential in addition to an executive transport role. Its cruising speed is specified at 265 to 285 mph, with a range of 1455 to 712 miles, depending on passenger capacity.

Making the first sea international application for G-E's J85/CJ610 engine family in the last four months, the West German jet will use two, fuel-injected, CJ610's, each developing 3400 pounds thrust.

Late in April the Canadian Department of Defense Production selected the CJ610 to power Canada's single engine CL-44 trainer.

A few weeks later, the U.S. Department of Defense awarded the J85-powered Northrop F-5A "Freedom Fighter" as the aircraft to be supplied to allied nations under the country's Military Assistance Program.

Besides international applications, two J85's are set to power the U.S. Air Force's Northrop T-38 trainers, and to provide boost for the Fairchild C-119 transport.

CJ610's will also power three other executive aircraft scheduled for introduction as well as G-E service—Aero Commander's Model 1131 Jet Commander, SAAC Jet Jet, and the Puccho-Douglas Wings Jet.

Other variants of the J85 family have been developed, including a 36 ft. design scheduled for flight testing next year as the Ryan VZ-11, an Army V-22OL research aircraft.

USAF's Mach 3 North American XB-70 'Valiant' will be powered by six YJ93 engines. A prototype aircraft is scheduled for flight tests before the end of the year.

YJ93 Deliveries Completed for First XB-70

CINCINNATI, Ohio—Last of the six YJ93 jet engines which will power the U.S. Air Force's first XB-70 aircraft has been shipped from General Electric's Large Jet Engine Department here.

Master flight of the giant Mach 3 XB-70 is scheduled for late this year, according to North American Aviation.

Deliveries of the aircraft's G-E engine began deliveries to North American last April.

First tests on a YJ93 were conducted in September, 1958. The aircraft later the engine demonstrated its ability to operate under conditions simulating those it would encounter in flight at 7000 mph (Mach 2).

Following completion of the YJ93's Preflight Refueling Test in September, 1961, the Air Force completed the first engine on schedule last December.

TWA CJ-805's BOOSTED TO 2200 HOURS TBO

CINCINNATI, Ohio—Three World Airlines recently received 1200 hour Time Between Overhaul approvals for the G-E and Electric CJ-805-3 engines which power their fleet of Convair 440's.

The new extension to 2200 hours by the Federal Aviation Agency is the highest allowable TBO for the CJ-805 associated to date. The hour contains the G-E J85-3 record of having attained the former achievement in 780 hours under ground FAA regulations.

TWA's 1200-hour TBO after annual monthly checks that G-E's original forecast for reaching that level, the Civil and Southern Airlines are expected to pass the 2200-hour mark soon.

Universal forward-sweeping wing made Handlung-Flugzeugbau's new HFB-320 executive jet early prototype. The 12 place craft will be powered by two fuel-injected General Electric CJ610's, each developing 3400 pounds thrust.

ANNOTATED RIGHT CONFIGURATION OF THE ARMY'S VTOL VZ-11 is shown in the newly released drawing. The right test aircraft, already under development by the Army Aeronautical Company, is due for flight test in mid-1963. Ground level lift by the propulsion system will power the VZ-11. Shown in the drawing are the X223-3 lift fan (1), and the X230-3 pitch fan (2), which supply power for VTOL, not altitude control. The G-E J85 engines (3) drive the lift fans and also supply thrust for level flight. Lift auxiliary tank (4) provides lift fan start-down and pitch fan flow control. Conventional control surfaces (5) include pitch, roll and yaw. Rotating pitch (6) and roll (7) and yaw (8) control surfaces. Converter duct (9) at a safety feature furnishing both lift fan with power in case of engine out situation. Main fan supply duct (10) delivers engine power to the pitch fan. At desired altitude after lift-off, descent valves (11) shut off the fans, and the VZ-11 transitions to normal horizontal flight.

FOR MORE INFORMATION

If you would like additional information on these G-E flight propulsion programs, write to your company liaison to General Electric Company, Section 8206-01, Schenectady 5, N. Y., USA.

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ABOARD A RADAR PICKET PLANE



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tive governments increase their restraint in the acquisition of new cargo and suggested that ICAO conduct a two-year study of costs and revenues of airports and mode facilities throughout the world. If agreed, the study would be followed by a special ICAO conference on the subject in 1994.

However, many airlines are pessimistic over the value of this approach since ICAO's projects are strictly of an advisory nature to the governments involved. In addition, a 1999 meeting of ICAO voted to delay any review of this matter until this year. The two-year study recently suggested may permit too much of a time lag to alleviate the problem, they contend.

Nearly four years ago ICAO recognized the problem of user charges and proposed up its findings in this manner:

"It is important that, so far as possible, airport and civil aviation should not be asked to meet costs which are not properly allocable to it. One should be taken in introducing any charges to be imposed for such as navigational facilities and services that suitable differences are made, for example, for other utilization of the facilities [including domestic and military, military and noncommercial use] the cost of any facilities which might exceed the needs of international civil aviation and any excessive expenditure in the construction, operation or maintenance of the facilities and services provided. Even when proper allocation is made, from these various factors, the expenditure costs allocable to international and aviation would in most cases be too large to be recovered in full in the form of user charges at the present time or in the near future without running the risk of reverting to the financial position of international air transport."

International Air Transport Association finds "with regret" that most governments have ignored the ICAO plan and have gone ahead with a series of new and added charges without providing the airlines with a cost analysis of the services and facilities or considering the financial impact upon the carriers.

Airport charges seldom reflect the full benefits to the governments provided by the airline business, IATA contends. Among these are the financial gains from tourism, increased employment and appreciation of local values surrounding the airport. Recognition of these benefits could take the form of tax concessions, land grants for airport construction or absorption of the capital expenditure by the state or local municipality.

At the same time, IATA and the airlines should not be forced to pay for terminal buildings and facilities which exceed their needs while a greater share of the airport operational expenses

should be assigned from non-airline sources such as the military and various government agencies.

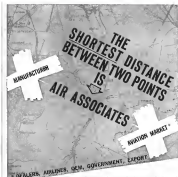
Since the practice of financing airports through user charges to the airlines is growing, IATA agrees with the passenger service charges levied by 12 European countries, most African nations and 9 other countries. In the past this charge has been collected by the airline for payment to the government involved. IATA supports the tax as a desirable alternative to higher user charges—where it can be collected by the government from the passenger thereby relieving the airline of an extra administrative burden.

ICAO points out that this tax amounts to half the total landing charges collected at most airports. Passengers do not seem to resent the charge, but in the future the tax could have a bad cumulative effect on the public attitude toward air travel, it said.

Paid taxes which constitute a heavy airline expenditure at international airports, should also be taken into account when governments calculate new landing fees or other charges, IATA contends.

Most of the confusion and misunderstanding which now exists over the growing amount of air route facility and overly charges could be avoided by a joint status of government financing for these facilities, IATA states. Such a system has worked well over the North Atlantic and the Indian Ocean. It could be applied widely in other areas. There should also be better flight information systems in areas where there are extensive small countries and no civil flight information agencies at that point, IATA said. This service also should be pooled under government financing, after which individual governments would be in a better position to determine the question of charging for the service.

Complexity and variety of the many route facility charges is not the best. For example, requests every traveling aircraft to pay a fee for charge covering any number of contracts with the Flight Information Services and also the services of air traffic control and radio navigation aids. New Zealand charges each international airline \$50 per flight. Haiti has a complex system of charges including a land charge per hour on radio watch maintained with an additional charge for each message. This system also includes a charge for terminal forecasts and a higher charge for forecasts in general. Chile charges international carriers according to route flown and the size of the aircraft. Mexico levies a charge based upon the cost of providing several radio, navigation and meteorological services, but does not include the costs Argentina has a similar formula while



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puted: Assume that 10 seven-pass DC's per week at Cape and five spare engines are stocked there. Total value of these engines, minus a reserve for depreciation (assumed), would be projected among the 10 engines. Cost of this particular pool, therefore, would be the value of the engines divided by 344 (12 weeks x 7 engines per week).

Each carrier at Cape would pay one-fourth of this weekly cost while it was participating in the Cape pool. A five-year amortization factor is used to compute the cost of components after this engine. Generally, a component just is returned or replaced within a week. Billing is done seasonally.

There are seven reasons to the master pooling agreement that cover spare parts in aircraft type, engines, ground handling equipment, ground maintenance equipment, inspection and electronic items.

Technical side of the airline industry has held to the philosophy that flying safely should be an uncorrupted, independent firm devoted by cost control to boost utilization of its jet fleet and shared freely with another, despite the fact the two airlines may be intense rivals for traffic over a certain international route.

This trend toward technical cooperation is being furnished by the parts pool.

Inventory Taken

Twice each year, during the first week of May and October, the pool members meet to take global inventories to their new summer and winter flying schedules. Regular representatives of United, Arab Airlines and Boeing employed by RAI are sent regularly to explain their need for spare along Middle East route patterns. Philanthropy of Pakistan International Airlines do the same with engineers of Aeroflot. BART, the state-owned airline of Yugoslavia, has applied for membership in the pool and may become its first Communist member.

Early at these semi-annual meetings — Air France will be at the end of the next session at Nice this October — is arranged by a committee chairman, a date the airlines settle on an alphabetical basis. In addition, there is a subcommittee appointed to oversee the subject covered by each of the seven sessions.

It is the chairman's job to compute accounts receivable and do the billing at the end of his month-term in office. All accounts, however, are settled through the IATA clearing house.

Delegates to the semi-annual meetings, with the approval of top management, have authority to commit their companies financially.

Using only the technical and administrative resources of members, shops are

a non-profit basis, the pool operates itself.

For sound reasons, the pooling of parts and equipment along international routes has developed for the more rapidly than it has within the U.S. Detached between the two worlds linking important trade segments often are so great that spare cannot be shipped quickly to meet an emergency. In the event of Movement of such parts at times a mid require dispatching a second aircraft.

Only alternative facing the international carrier was to purchase individually around the world. Capital was then tied up weekly and aircraft payments on money borrowed to buy seldom used equipment strained cost structures.

In the U.S., however, most major supply depots are only several hours from the farthest point on a carrier's routes. In addition, at many U.S. airports, departures scheduled by all airlines reach a peak three times per day—morning at 5 a.m., 12 noon and 6 p.m. During these hours, most airlines would want to borrow ground support and maintenance equipment instead of sharing their own with others.

Despite these problems, seven U.S. airlines began operation of a formal pool in April, modeling it after the international one already in operation. Initially, 315 different kinds of parts valued at \$1.7 million and stockpiled at 13 U.S. airports were pooled.

This summer, TWA, United, Eastern and American began discussing the parts pool they intend to set up for the Boeing 727 when it enters service in late 1964. According to James A. Roush, TWA's senior director of engineering, believe that have ordered the 727 large to reduce capital investment in inventories by about \$5 million through pooling.

Parts and equipment in the international pool, by contrast, are worth an estimated \$75 million, according to J. J. Malinas, Pan Am's superintendent for pooling. Participating in sub-pools worth 25 of the 34 airlines that have signed the master international agreement. Pan Am provides for others, at 37 of its own stations and inventories at 64 additional stops.

As of this spring, the total value of goods in which Pan Am participated was \$1,119,083. Included was \$7,045,000 worth of parts provided by Pan American. In addition, Pan Am has pooling agreements with American, United and Northwest within the U.S.

Pooling on this scale is now making an impact on the manufacturers of airline transports and airport shops. The airline industry has long suspected that customized transports are business few will be able to afford in the event of expensive repairs. Nevertheless, pressure to end the practice of buying take-only aircraft must come from the

airline, not the manufacturers, whose profit is a percentage of price sales.

This type of pressure is being generated as a result of savings realized by airlines through pooling. Prior to buying Boeing 707-121Bs for example, Pan Am counted its aircraft would be compatible with those ordered by another airline attracted to buying a 707-121B pool. These have been added in various of airlines foregoing major modification that would disrupt their production in the global pool.

Almost certainly, competition among the carriers to join progressively will reach a peak prior to the September 1964 introduction. The cost of

that aircraft, between \$10 and \$30 million to most estimates, and the likely cost of its support items will mean the purchase of fewer units.

But it will also cause greater model variations among those that are bought, according to Pan Am's Malinas.

It is unlikely that joint purchasing of parts will be introduced prior to the September transport, if the flexibility needed is provided by pooling. But U.S. airlines already are exploring the feasibility of one separate transport parts pool, spread and owned either by an independent enterprise or a subsidiary formed by a purchasing airline for that purpose.

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Latest Sperry subcontract is for stable platforms for Air Force's Minuteman, to provide exacting references against which the slightest change in the missile's course

can be measured with high accuracy. And at the extreme end of the missile spectrum is Army's Nike Zeus—the nation's only anti-missile missile system in advanced development—for which Sperry provides the critical extended range target tracking and discrimination radar transmitters.

In addition, Sperry has supplied a number of aiming and fusing systems, a wide variety of ground support equipment, and supercavitating miniature components for missiles and space vehicles—to help America's missile men "call the shots" with ever greater certainty.

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Europeans Push Varied Transport Designs

Great-European aerospace manufacturers, buoyed by the export success of the Sud Caravelle turboprop and Fokker F27 turboprop, are developing a wide spectrum of transport designs ranging in scope from the super-size to downtown localizers.

Most also are following the uniting philosophy behind the acceptance of the Caravelle and F27, designing toward them largely overlooked by U.S.

firms whose home market potential often can drive prices to levels with which other manufacturers of similar products from abroad cannot effectively compete.

French industry's target technical and financial hopes are now riding with the 100-passenger Mach 2.2 Super Caravelle program, a medium-range aircraft designed to fill the range and speed gaps left by the U.S.'s airlines

tion toward greater stage lengths at higher Mach numbers.

For the moment, however, the program appears to be caught in a political limbo. French and British governments spend last spring to jointly finance the project with each equally sharing the estimated \$280 million development cost. Thus far, France has allocated \$24 million for detailed design study work, but no other funds have been forthcoming.

Further delays of any substance could seriously affect plans to have the aircraft on the market by 1968, several years before the larger U.S. designs, and erode its overall sales opportunities.

Such a delay also could be critical to Sud France's industry trade associations, the Union of Aeronautical Industries, recently warned that final approval of the project is "essential" if Sud is to avoid a serious production gap after delivery of the standard Caravelle series have been completed.

Management Debated

Management structure for the program, however, is still being debated between the British and French, although performance comparisons already have been made and largely agreed upon. France will seek by its original specifications for a 1,600/1,600, an eight length aircraft, while a second version with transatlantic capability will be developed to meet British criteria.

Aircraft, with four powerplants based on the tail of the fuselage, will be powered by either the Bristol Siddeley Olympus 593 turbojet or a Rolls-Royce design now under development if Anglo-French cooperation becomes a reality.

If it does not, Sud may turn to either Pratt & Whitney or General Electric in the U.S.

Sud, meanwhile, is continuing to seek variations of its standard Caravelle in hopes of keeping its production lines open and moving.

First model of the more powerful Caravelle 16A powered by two General Electric CF6B-40 turbo engines at 16,000 thrust each was scheduled to roll out from Sud's Toulouse production facility late last month, and the French government was expected to underwrite the cost for specifications production of 10 of the aircraft.

Most likely customers, such from Air France, appear to be KLM Royal Dutch Airlines which is currently seeking a replacement for its Lockheed Electra-turboprop fleet. KLM, however,

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NARATE has been tested at the Navy Electronics Laboratory, San Diego, for integration and compatibility with a complex air search radar. It is now installed aboard the USS Columbus for evaluation in fleet operations. Based on the proven Datco automatic test equipment concept, NARATE was developed for the Navy by the Northrop Division of Northrop.

NORTHROP



CARGO LOADING DOCK, 32 x 24 m, has been cut into Gulfstream foreleg to demonstrate cargo hold capability for military missions.

Gulfstream Viewed as DC-3 Replacement

By James D. Headrick

Bedford, N.Y.—Gulfstream Aircraft Engineering Corp. has modified the interior configuration of its No. 1 Gulfstream IIa prototype here in an attempt to demonstrate that the transport executive aircraft is suited to replace aging DC-3s in civil and military transport operations.

Gulfstream already has provided demonstration flights for several Navy and Air Force officials who are seeking replacements for their DC-3 versions—designated C-47s by USAF and R4Ds by Navy. Representatives of the Long Island, N.Y., company also have visited the Pentagon frequently in the past few months to discuss the possibility of orders for the Gulfstream, a plane at present which has been sold to almost 100 business firms in the U.S. and abroad for administrative use.

Next week, the No. 1 Gulfstream will be flown to Las Vegas, Nev., for static display and possible demonstration flights at the annual Air Force Asia convention.

Additionally, Gulfstream has proposed the Gulfstream to short-haul air lines which now use the DC-3. The company is doing the phone-over-teletype short segment routes in the U.S. to complete distributed performance data on its applicability to the DC-3 commercial role.

If Gulfstream can penetrate either the commercial or military markets with the Gulfstream as a "new DC-3," the company will have prospects of selling up to 1,000 or even more aircraft in this country and overseas, it contends.

Gulfstream estimates that there are about 900 DC-3s being operated in the

commercial market alone—approximately 200 of those in the U.S. The Air Force still has about 750 C-47s in service, while the Navy is still operating slightly over 300 R4Ds.

However, the military market hinges on the unpalatable annual defense budget. "If money gets tight in the Department of Defense, the services will start dropping from the bottom of the budget up in order of increasing priority," a Gulfstream official pointed out. "If that happens, orders for the new support aircraft will be among the first to lose funding."

Therefore, Gulfstream is being smart at its sales efforts to the commercial operators. Under the sponsorship of Civil Aeronautics Board Chairman Alan Reed, several major aircraft manufacturers in the United States are presently developing either modified versions of existing aircraft or entirely new designs to fill the DC-3 slot (AW Apr. 30, p. 49).

Besides the Gulfstream, leading contenders among already-registered aircraft are Fairchild Swearingen Corp.'s P-27 turboprop transport and Fokker's F-27 (the latter being pushed by its U.S. distributor, Triad Flight, Inc.). Reed said that the DC-3 replacement should fit these requirements:

- Passenger capacity of no more than 24, with adequate space for baggage and 1,000 lb. of cargo.
- Fuel capacity sufficient to permit four unrefueled stops on 500-mi. stage lengths with no more than one refuel stop.
- Runway requirement of no more than 4,000 ft., if possible scaling down to shorter takeoff or even certified takeoff capability.

• Price of less than \$750,000 per plane, including essential avionics.

Gulfstream is having its campaign on the fact that the Gulfstream is a multi-mission in these specifications and that the aircraft has proven itself in operation, with more than 75,000 flight hours accumulated since the prototype carrier was introduced three years ago (AW Oct. 5, 1959, p. 42).

The transport which the company is offering to commercial carriers is a 24-passenger version of the Gulfstream which has been flown by company pilots over five 108-mi. trips without refueling while carrying 14 persons with 30 lb. of baggage each and an additional 1,000 lb. of cargo stowed in a compartment aft of the passenger cabin.

Passenger air carried in eight rows seats—two abreast on one side of the aisle and one row on the other. Seats can be attached and removed from fittings on the cabin floor in a few minutes to prevent the two-abreast sections to be placed on either side of the cabin. Cabin length is 30 ft. 5 in. width is 55 in., and the floor-to-ceiling height is 71 in.

Flight attendants' seats are fold-down and a crew rack can be placed at the rear of the passenger cabin. The 108-in. ft. baggage hold, on each side of the aircraft between the cockpit and passenger cabin, can accommodate a total of 720 lb.—meeting FAA's 30-lb. per passenger specification. Rods and other electronic gear can be stowed on the stowed side of the flight cabin next to the baggage hold and opposite the main door of the aircraft. Aircraft binders are located on the port side just aft of the door.

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across during flight through a swirl down in the rear wall of the passenger cabin. Seats will be loaded through a door in the aft starboard side of the plane.

The Gallician passenger cabin is pressurized to 8,000 ft. at the maximum certified altitude of 50,000 ft. and 5,500 ft. at the normal 15,000 ft. cruise altitude.

There is no change in the basic Gallician airframe, but the short-haul commercial transport version will weigh only 15,000 lb. at takeoff, compared with 16,100 lb. for the customer version. Weight saving results partly from elimination of some of the sophisticated electronics systems, usually preferred by business firms purchasing administrative transports, and partly from less fuel requirement for the short-haul version.

Electronic complement on the Gallician transport will consist of dual VHF communications and navigation gear, a glide slope indicator, single master beacon, an ADF unit, transport deck, weather radar, radio system and a compass. The electronic version, in addition, offers various Doppler radar gear. Loran system and other backup electronic equipment not sold to a low-draw transport making only short trips over land.

Cannon officials do not feel that any company can hold its own at price to \$100,000 for a DC-3 replacement due to the higher price tags on modern electronic equipment and the general rise in production costs since the day the DC-3 was on the assembly line.

Although no definite price is quoted by the company, the overall figure probably will fall about halfway between Ray's \$100,000 level and the current price of approximately \$400,000 for the Gallician commercial version. Again, five reduction in price for the transport version is attributable to elimination of costly electronics.

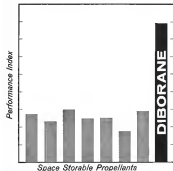
Cannon's point here is that the Gallician's improved performance over the DC-3 in terms of cruise mileage, speed, range and payload—plus the appeal to passengers of a new, modern aircraft—will more than make up for the higher cost of the Cannon plane.

"If the airlines can achieve an average load factor of 50 to 60%, they'll make money," Bruce Harrison, Cannon project engineer said. "We believe the Gallician can help them reach that average."

The military transport version will accommodate 15 passengers or carry up to 7,500 lb. of cargo under normal conditions, according to Warren T. Schweitzer, chairman of Cannon's executive committee. A cargo door, 62 in. high x 54 in. wide, has been out-

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U.S. Army H-21 AN/ASW-1200

U.S. Army HC-119 AN/ASW-80

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	Boeing 707	Boeing 720	Boeing 737	Boeing 747	Boeing 757	Boeing 767	Boeing 777	Boeing 787	Boeing 797	Boeing 800	Boeing 810	Boeing 820	Boeing 830	Boeing 840	Boeing 850	Boeing 860	Boeing 870	Boeing 880	Boeing 890	Boeing 900
Boeing 707	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124
Boeing 720	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124
Boeing 737	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124
Boeing 747	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124
Boeing 757	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124
Boeing 767	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124
Boeing 777	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124
Boeing 787	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124
Boeing 797	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124
Boeing 800	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124
Boeing 810	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124
Boeing 820	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124
Boeing 830	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124
Boeing 840	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124
Boeing 850	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124
Boeing 860	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124
Boeing 870	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124
Boeing 880	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124
Boeing 890	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124
Boeing 900	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124

Total Average	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124
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Total Average	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124
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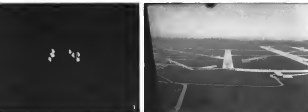
Total Average	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124
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Total Average	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124
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Total Average	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124
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Total Average	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124
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Total Average	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124	12.124
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MICROVISION, new blind landing aid developed by Bendix, gives pilot an outline of airport runway which simulates appearance of runway lights on clear night. Series of photos (above and at right) show Microvision display and corresponding view from cockpit during flight tests conducted by USAF at Patterson Field, Dayton, using early experimental equipment. In operational installation, additional beacons would give more effective illusion of runway lights.

New Blind Landing Aid Is Demonstrated

By Philip J. Klein

Teterboro, N. J.—Microvision, a handsomely different type of blind landing aid which shows the pilot an outline of the airport runway under all weather conditions and his position in relation to it—much as it he were viewing the runway lights at night under VFR conditions—has been successfully demonstrated by Bendix Corp.

Preliminary flight tests conducted by the Air Force's Aeronautical Systems Division at Dayton have been sufficiently promising to prompt the Federal Aviation Agency to allocate funds for additional development work on the system. Original Microvision development was funded by Bendix.

The new technique has earned wide acclaim from pilots who have flown it according to Bendix, because it is not a direct substitute for the transition to contact flight as it is in VFR.

In the experimental USAF installation on a Convair C-119, the display is shown on a small cathode ray tube in the cockpit. In a more advanced installation now being incorporated into a Bendix DC-3, the presentation will appear to be superimposed on the aircraft windshield, as if it were far ahead of the airplane, further enhancing the contact flight illusion.

Despite limitations of the experimental installation in USAF's C-119 and ground facilities installed at Patterson Field, one Air Force pilot described as much confidence in Microvision during the preliminary tests that he made an unscheduled landing while under the hood using the system.

In concept, Microvision is depicted simply. The ground installation consists only of a group of small low power radio transmitters which are placed on both sides of the runway and

spread along its length much like ordinary runway lights.

The airborne equipment consists of two pairs of receiver-type antennas, one pair spaced vertically, the other horizontally, a four-channel receiver and a suitable cathode ray tube display. The four receiving horns are installed in the nose, and pointed ahead relative to the aircraft's forward axis. In an operational installation, these horns might be installed on the back side of a weather radar antenna, or flush-mounted around the periphery of the radome.

Each of the ground beacons transmits approximately 400 pulses per second with no attempt to synchronize the transmitting bursts of the several ground beacons. When a pulse from one of the ground beacons is received by the aircraft, a comparison of the relative amplitudes of the signal received at each of the two horizontal antennas is made to determine the angle of the beacon as a horizontal plane with respect to the aircraft's own

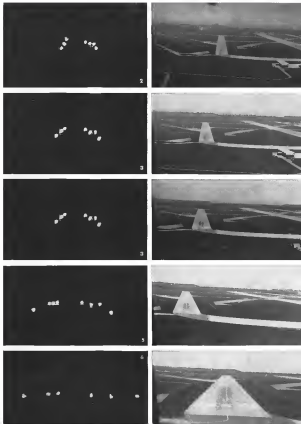
tailfin. A similar comparison of signal amplitudes at the two vertical antennas is made simultaneously to determine the angle to the beacon in a vertical plane. This is a technique similar to that used in monopulse radar.

The beacon's horizontal and vertical angles then are used to displace the electron beam of the cathode ray tube by a proportional amount in a horizontal and vertical direction, and the beam then is energized to produce a spot on the tube face. When the next ground beacon transmits a small fraction of a second later, the process is repeated.

The net result, as seen by the pilot, is a group of white spots one for each ground beacon, which shows a strong resemblance to the appearance of airport runway lights at night during VFR conditions.

Correct thinking at Bendix is that about 12 ground beacons, one on either side of the runway, are sufficient to provide an acceptable replica of the runway lights. However, the experimental installation at Dayton and a second planned for Friendship Airport in Baltimore, use only eight ground beacons for runway scenes.

This points up another attractive feature of Microvision, particularly for military applications and small airports. By installing six or eight beacons, an airport can be given an initial capability. Later, when time and/or finances permit, additional beacons can be added. The beacons could be battery-powered and can be quickly installed without





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cally adjust the phasing of each power amplifier.

Approximately 2000 feet of 3/4-inch, Haloblen-jacketed Styroflex[®] cable, with a power loss of about 20 db, is used to deliver one watt sample signals from the nine directional couplers to the phase detection equipment input. All of the aluminum-sheathed, air dielectric Styroflex[®] cable was provided in pre-cut lengths and held to close electrical and mechanical tolerances.

Each sampling cable was inserted in a plastic pipe buried underground with water circulated through it to assure equal temperature throughout the entire cable sampling sys-

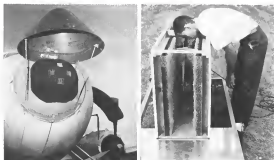
tem, in order to maintain electrical lengths to within 1/4 degree. Excess cable from the short runs was coiled and stored in the manner shown below. The cables received final adjustments within 1/2 of a degree of equality at the time of installation.

Styroflex[®] coaxial cable was selected for this Navy "Spur" station because of its outstanding transmission line qualities and great adaptability. These same qualities make this semi-flexible, low-loss, high frequency cable ideal for a number of commercial, industrial and national defense uses.

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EDGE-PENETRATOR, new blind landing aid developed by Bendix, now has matched beam antennas, two in vertical plane, two in horizontal plane, which receive signals from radar beacon ahead of target runway. Experimental installation is in USAF C-119 field. Equipment ground losses are of eight installed in USAF tests at Dayton, has 30 db gain power, accurately 400 points per second. No time classification is required between location. Beacon signals can be received eight miles or more from runway.

elaborate alignment is checked out, an other important advantage for military use in limited surface situations.

Present Bendix estimates are that each ground beacon will sell for about \$15,000 or less, so that the cost of 12 beacons for an airport would sum about \$180,000, not including installation.

Automatic recovery and automatic test expected to occupy a total ATIS rate weight approximately 25 lb, and be priced in the \$15,000 to \$25,000 range. These figures do not include the cockpit display.

A windshield projection type display is expected to weigh approximately 30 lb and cost about \$12,000, but a non-projection type of display would not considerably less, particularly if the search were equipped with a weather radar whose scope could be used.

Bendix acknowledges that the British Royal Air Force Establishment previously represented with ground beacon beacons and airborne direction finders.

The British effort was not successful, Bendix says, because it was based on direction finding by phase comparison rather than by amplitude comparison.

Approximately two years ago, Bendix formed a company cooperative with Howard Morgan, to investigate possible solutions to the off-beacon landing problem which might be developed from know-how available in several divisions of the company. These included the Bendix Research Laboratories in Southfield, Mich., and both the

Edge-Penetrator and the Radio Division.

After examining a number of techniques including the use of altitude, the Research Laboratories decided to investigate the Microwave technique based on considerable in-house experience in microwave direction-finding according to Jay Schindler who directed the program in the Research Laboratories.

An experimental version was built and installed at Detroit in the winter of 1960, with a companion Bendix unit at the flight test center. In April, 1961, Bendix invited representatives of the Flight Control Laboratory, Aeronautical Systems Division to fit the experimental installation. Bendix was sufficiently impressed so that the Air Force contracted with Bendix to build equipment for an installation at Dayton which was completed in May of this year.

Bendix also invited engineering pilots from several U.S. and international airlines to fit the experimental installation at Detroit. In all cases, the station was to enable complete use.

New that the technology has moved beyond the research stage, the company has assigned major system responsibility for Microwaves to its Edge-Penetrator Division. The company's Radio Division, Farming, Md., will design the airborne microwave receiver and ground beacons, in a subcontractor to Edge-Penetrator, while the latter is responsible for design of the cockpit display.

Motion pictures made in the cockpit of the C-119 during approaches to Pontreux Field, show that the ground beacons can be picked up when the aircraft is about eight miles away. However, they appear as a blob of spots on the scope and do not begin to resolve into individual beacons until the aircraft has come to within about four miles.

At a range of about three miles, the eight beacons begin to take a form which resembles parallel runway lights. By one meter the aircraft has descended to standard threshold feet altitude, the beacons appear as an inverted "V" which begins to spread rapidly as the aircraft continues its descent.

At the bottom of the leg of the inverted "V" gives the pilot a rough idea of his altitude. When the spread is roughly 30 deg., altitude altitude is about 200 ft., when the spread is roughly 110 deg., altitude altitude is about 100 ft.

Question of whether Microwaves has the inherent capability of serving as a power blind landing aid or could be a secondary (back-up) to enable the pilot to maintain the performance of a present system is not likely to be resolved until additional tests have been run and more development has been carried out.

Edge-Penetrator currently is conducting extensive simulation tests at its facilities here to derive improved Mission display techniques. Work to

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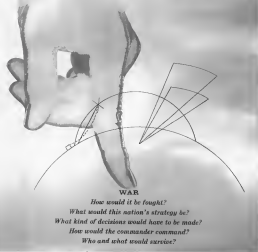
Control Systems (such as SAGE); Intelligence Systems (such as MIDAIS); and Warning Systems (such as BMEWS).

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data, coupled with flight tests, suggests that the Microwave display should also give the pilot some indication of his tail angle relative to the horizon. This can be obtained from a horizon gyro, or possibly by means of some type of horizontal scan of ground horizon.

Tests conducted at Patuxent Field have shown that both in actual sighting situations as in the vicinity of the runway can produce spurious echoes which cause an apparent shift in the location of one or more of the Microwave ground returns.

Part of the funds which FAA expects to provide briefly will be used to developMicrowave antenna having good directivity to reduce the amount of spurious reflections. In a production design, the horizon can be expected to be less than 24 in high and therefore, to present no antenna installation problems.

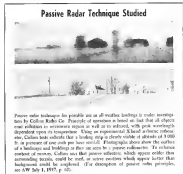
Microwave horizon now situated at Patuxent Field opposite at Naval Air Station. The original horizon at Duxton has a peak power of 15 kw, but Borden Radio Co. C. R. G. has said that a peak power of 7 kw should suffice.

In addition to previously mentioned advantages of the Microwave concept, Paul Nauman, director of advanced systems for Elicap, Patuxent, cites others:

- **Fail-safe:** Loss of one or two ground returns is an aspect rarely equipped with 100 percent because loss of relative adverse effect on system policy since the remaining units still provide an adequate sensor output. Almost any type of adverse equipment failure either results in complete loss of display or so badly degrades it that the pilot is usually aware of the fact.
- **Calibration:** The earth clutter returns can easily be checked in flight by measuring the same signal into all four channels which should produce a centered dot on the display.

- **Natural transition:** Unlike some proposed blind landing systems, which require the pilot to make sudden transitions from a synthetic output display to actual landing conditions in critical periods before touchdown, the transition from Microwave to sensor display is easy and natural. Thus the pilot can begin to use Microwave while he is still visual only out, keeping his performance at a safe altitude, until some system which can not be checked as accurately as it should should.

- **Passive warning:** Microwave could be used to provide limited advance warning of a small sailboat, similar to the ground returns but with an omnidirectional antenna, it could be used to search for result equipped with Microwave sensor providing the search was within an angle of about 20 deg of later's flight direction.



Passive radar technique for possible use in all weather landings is under investigation by Collins Radio Co. Principle of operation is based on fact that all objects emit radiation in microwave region as well as to reflect, with peak wavelength dependent upon its temperature. Using an experimental X-band active radar unit, Collins tests indicate that a landing strip is clearly visible at altitude of 1,000 ft. in presence of one inch per hour rainfall. Photographs above show the outline of a landscape and buildings as they are seen in a passive radar return. To enhance content of return, Collins says that passive radars, which appear earlier than surrounding terrain, could be used, or active radars which appear later than background could be employed. (For description of passive radar principles, see EW July 1, 1957, p. 62).



CHECKING THE POLARIS MISSILE

Designed to process data from 180 channels at one time, a CSC system is now in use at the Scripps Institution of Oceanography, test facilities of the Lockheed Missiles & Space Division.

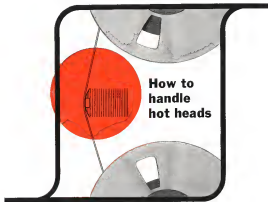
Measurements of strain and temperature, recorded at hundreds of points on a Polaris missile being tested, are changed to proportional analog voltages by 11444 channels and processed by the system for digital recording on magnetic tape compatible for direct entry into an IBM 7090 computer. In addition to monitor trace recording, output is available in the form of IBM punched cards and X-Y plots. Monitoring is by two graphs on a 27-inch oscilloscope and oscillograph readouts.

The Thermomechanical Recording and Monitoring System is one of hardware produced by CSC for defense contractors, universities, government and agencies. In addition to analog and digital data handling systems, CSC designs, develops and manufactures systems for industrial control, electro-optical, pressure and hydraulic measurements.

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It is being created by new men, with new ideas, new processes, new techniques. Once the most productive sound in this industry was the roar of assembly lines. Today the most productive sound is often silence. The silence of man thinking. Thinking of things never done before... of metals never used before... of tools never designed before... of systems never conceived before.

Airplanes are still being built. Yet they are planes vastly beyond the ken of even the wildest of yesterday's dreams. And this is just one part of the industry.

Nearly every scientific discipline known to man is being probed, explored, and used within the aerospace industry. Nuclear science, electronics, rocket propulsion, life sciences, chemistry, and communications are just some of the fields being pursued.



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Botanists and physiologists are studying the possible use of plants in the free world's program to explore space.

Electronics engineers are studying microelectronics.

Rocket engineers are perfecting giant rocket engines that will have millions of pounds of thrust.

Geologists are extracting water from rock.

Bio-engineers are designing hand-tools for use in space.

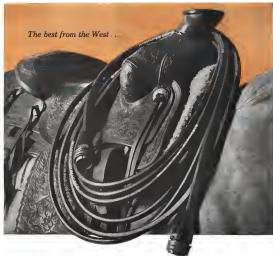
All these men, and many others in even more diverse fields, are part of today's aerospace industry.

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The plant is designed to meet the standard and special-purpose requirements of aircraft, missiles and ground-based electronic equipment. Sales and service for cables and connectors and all other Scintilla Division products will still be handled out of 117 E. Foothill Blvd., Burbank, Calif. Bendix Connectors—Bendix Cables—Grouped together to work best together.

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lays down by the potential operator of supersonic transport.

Other major contributions have come from industry, which has supported the widest range of studies on the subject. All the major manufacturers of transport aircraft have been drawing paper airplanes for some time, laying out and refining the outlines as new data come along. Several of the companies have made and tested scale-model models of contemporary concepts of their own and NASA designs to get solid data for detailed analysis of performance. And with an eye to the eventual commercial market, new estimates at between \$14 billion, they have made detailed market surveys and cost analysis of the operation.

But the solid foundation stages of the supersonic transport program now in the hands of research, development, design, construction and operation of current supersonic aircraft, plus the anticipated benefits are now starting to roll in from the RS-70. Mach 5 reconnaissance-stroke aircraft, due to fly before the end of this year.

Military Contributions

The contribution of that military aircraft to the SST program is not too well understood. Most of the problems of an SST will be solved through the flight experience of the RS-70, but never of the SST's problems will be unique, and not even approached in the RS-70 design. Perhaps the best definition of the relationship between the two types of aircraft is to say that the supersonic transport is complementary to the RS-70.

The time gap between this year's flight of the North American design and the future flight of a supersonic transport means that the aircraft must be a later concept, and must be more advanced in design, simply through the advancement of technology with the passage of time.

There are further differences. The RS-70 is a relatively short-lived military airplane, whose mission performance is its reason for being. High utilization will be expected. Airline air-crafts will not be required in thousands, rather, tens of thousands of hours.

None of the RS-70 will be accepted as a prototype jet. Large fuel consumption of its engines will be tolerated because that's the way the thrust will be generated.

With the supersonic transport, the story will be different. These differences of fuel cost, operating cost, utilization, engine and airframe life and more all lead to a more advanced design than that represented by today's RS-70. These are the problems that one must or must not solve to make or make not the supersonic transport and these are the problems that currently are the most closely defined.

Finding solutions to these problems is one of the major jobs of the Supersonic Transport Working Group headed by Hefner. This past three-month group, with a single representative from FAA, NASA and the Department of Defense, is the top-level leadership of the program. Advisors look for this group at the Supersonic Transport Advisory Group, chaired by Gen. David C. Cook (USAF, ret.) and made up of private citizens with backgrounds in business, defense operations, management, research, test flying and airport operations.

Chaired by command from Hefner

down to the working level goes through the new FAA deputy administrator for development, Robert J. Sherk. One of Sherk's subordinate offices is headed by Melvin Gough, who is director of FAA's Aircraft Development Service. Gough's responsibilities include all aircraft development, whether it be VJ, SST or the supersonic transport.

The working level includes three organizations. First of these is the FAA Supersonic Transport Program Management Office, directed by Col. Lawrence S. Reckitt, Jr., an Air Force officer assigned to the program and serving in the FAA. Reckitt's office is the focal

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From Johns-Manville, manufacturers of Miro-K and Thermo-K (the only thermal insulations used aboard the Mercury spacecraft), come two equally important products... J-M Microbestos Fiber and J-M Micro-Quartz Fiber. They are designed to provide reinforcement for high-temperature plastics such as exhaust nozzles, nose cones and semi-permanently heated surfaces. Microbestos Fiber is a high-purity, high-bulk, synthetic paper made of asbestos or asbestos in combination with other organic and inorganic fibers and fillers. It is capable of withstanding up to 300°C. micro-quartz fiber. Micro-quartz-reinforced products fabricated with common resins systems are available from leading manufacturers of forming sheets, tapes, and molding compounds.

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JOHNS-MANVILLE 

hedge, powerplants and wing to account for low non-aerodynamic Richard T. Whitcomb, who developed the concept of the area rule is the originator of the SCAT-4 geometry.

First test data of the SCAT-4 layout shows superior lift/drag ratios much greater than those of the RS-70, but subsonic lift/drag ratios below those of current jets, although a bit greater than those of the RS-70.

Third Design

Third layout sponsored by NASA is the SCAT-5, a four-deck wing raised configuration resembling at first glance the RS-70 and several of the industry early proposals. This layout, being developed at the Ames Research Center, is an attempt to push the technology of the delta-canard geometry to its limit, taking advantage of everything learned since the RS-70 design was frozen. Reports indicate that the Ames team have test data showing the clear superiority of their design over the earlier RS-70 layout. They also are confident that such a layout can break an air plane capable of meeting the FAA fold-length requirements, which spell out current runway lengths as desirable for the supersonic transport.

NASA researchers say the first to point out that their job is not to design the supersonic transport. Their task is

to make the first conceptual layout of possible aircraft that could do the job from an aerodynamic point of view. Other portions of their agency, plus private industry, will be supplying data on structures, powerplants, instrumentation and the thousands of other problems areas that must be tackled before the design of a supersonic transport becomes a certainty.

Two major problems stand out: noise, both due to the engine and to the tail boom, and fuel economy. Both of these are related to engine design and technology.

The general goal is to get engines that use air more than 10% lighter than power today's subsonic jet transports. That is no easy problem. Observers with long memories can recall that when the first and second generation of turbojets went into service on scheduled airlines, it was a shocking process that the next generation—the turbojet powerplants—would be such quacks. That generation has now, and the passage wasn't kept. It turned out to be true in some respects, but the noise was lower. But the noise problem of recent complaints have been against turbojet transports during approach to commercial airports. And there is not much room for argument, these jet engines are noisy out front.

Not all powerplant producers are not

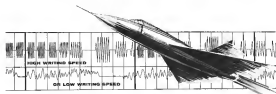
convinced that the fan will stay to power the supersonic transport, away from the noisy take-off cycle will be needed, and there are a few who just want to use a larger straight turbojet. But wherever you turn your eye, there is a lot of work needed before the noise level is made acceptable.

Some noise problem is a different one. As long as there is supersonic flight, there will be noise booms. They certainly will vary, depending on the time of day, the weather, the meteorology, the engine flight path, the position of the observer and the subjective reaction of the observer. The only certainty is that there will be more from the noise boom. How much, and how tolerable, are two areas of a current and long-standing program being handled by FAA/DOD/NASA. From their tests, both in flight and in the wind tunnel, they hope to learn enough about the problem to be able to fix some new sections of attack.

Fuel Consumption

Fuel consumption of the engine will be the deciding factor as to whether or not the craft can be operated economically. The kind of consumption now tolerated on the RS-70-1 could tell you what it is, but you wouldn't be here the numbers, and we quoted engines—will not be permissible by the

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supersonic transport. Indications are that RS-70 fuel flows have got to be cut to at least one-third of their present values to make similar engines useful for supersonic transport.

This is one of the reasons for the slightly larger content of FAA funds now directed toward propulsion research through contracts with the major airframe manufacturers. Typical of these contracts is one with General Electric's Flight Propulsion Division for \$1,394,000 in subgrants of a total effort of \$1.1 million. The contract, let by Air Force's Aeronautical Systems Division on behalf of the FAA, will sponsor applied research in component, component and turbine flow, component design, control reliability and a variety of other tests. GE will also do cycle analyses for both subsonic and supersonic speeds. Close study of the contract work shows how FAA is able to take advantage of work already done in many of these areas. Prior to the FAA award, GE had been doing a comprehensive analysis of engines for the supersonic transport. The company has also developed the V99 turbojet for the Mach 3 RS-70 design. It had contracts with USAF for advanced component development work. This background is available to the GE engineer studying the supersonic transport engine.

Part of the contract with FAA covers the integration of the engine with the vehicle, one of the most critical portions of the overall aircraft design. GE and Lockheed Aircraft Corp. both received FAA contracts for work in this area. These undoubtedly will be a lot of work in a year of the close collaboration of the GE engine in the Lockheed F-104 aircraft.

This typical collection of contracts in propulsion research is part of a 16 projects research contracts with 22 different companies and three on a continuing basis with the government. These range the technological spectrum from the reliability of glass windshields to the distribution of stress due to thermal shock.

As in the case of GE, most of these contractors have close either contract work to another agency or the status of their FAA research. One example is a recent award to Republic Aviation Corp. covered research on high-temperature hydraulic fluids, seals and systems. Republic has been working on the development of a 1,000°F hydraulic system for USAF. The supersonic transport contract in this category undoubtedly will be based on that earlier work.

Many of the contractors have worked on the RS-70 program, or are still working on it. Their direct client will be made available to the program as a "need-to-know" base. One example of this is a series of three contracts let to North American Aviation for studies

of stresses and weight relationships of typical structures work on wing panel flutter and determination of loading input loads. The background NAA has for this work from its RS-70 program will aid in such making of such studies and will mean that NAA can start its transport work at higher level of knowledge instead of at zero.

Generally, then, the status of the supersonic transport is one of definition of some of the technical problems and study of others.

But there is general agreement that right now, studies of the commonness of such a transport are premature. As more and more relevant data becomes available, the substantial outlays of latest operating tests may take on more solid form. Still, angle factors, such as the price of fuel, may change during the next few years and there are indications made this year or next right out the window. Some idea of the critical effect fuel cost has was given last year at the IATA meeting, where one delegate said that fuel costs meant up one cent a gallon, it could change the supersonic transport from a money-maker to a money-loser.

Mach 3 Goal

So progress continues toward the ultimate goal of a Mach 3 transport that can cruise the world routes between cities 1,500 mi apart. It will require considerable time to the point where the time to test and then the arrival or either will well demonstrate the due time of the time. It will fly across the United States on shorter stage flights, and hopefully, have enough flexibility to do that with a variety of some projects needed supersonic cruise.

It will provide a major reason during the next decade for the aerospace industry, at least that portion of it that is not tied to space flight.

And, if it is timely, it may provide an important partner factor when American cannot start to operate the commercial supersonic transport. It is the latter argument that often takes over when all other logical possibilities have been exhausted. Why does the U.S. need a supersonic transport? There are many answers to this question, and not all of them valid. But a frequent response is, "Because if we don't get one, the Russians will build it first."

In fact, Russian action substantiates that and that they are now working on a supersonic transport, namely, designed as an aircraft carrier, or a modified supersonic bomber. What over the field from their program is a safe bet that there is, somewhere inside the Kremlin, an official who sees this or that to step up the pace on their supersonic transport. "If we don't get one, the Americans will build it first."

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CORE SET (center foreground) for Hercules third stage motor consists of a tapered center cone and four wing cones which lock in place in center cone. Center cone is mounted through gasket part and wing cones are placed in position through the four cone ports. Legs on wing cones are attached to be withdrawn by hydraulic jacks. Crisscrossed sections on either side of third stage cone are supporting brackets for propellant loading operation. Wing cone of third stage motor is shown being withdrawn from one of the cone ports (right).

Minuteman Propulsion—Part 3:

Hercules Stage 3 Uses Glass Fiber Case

By Irving Stone

Magna, Utah—Underlying the development of design and production approaches devised for the Minuteman (intercontinental ballistic missile's solid-propelled rocket motor, Hercules Powder Co.'s third stage for Air Force's mobile delta launchers from the first and second stages.

The third stage built here at the company-owned Hercules Works and in the newly activated, Hercules-operated Air Force Plant 51, has a glass-fiber-reinforced case instead of steel, and a different propellant system and outer pattern. Significant of the three Minuteman propulsion units, the third stage has a diameter of approximately 37 in. and a length of about 90 in. from top of forward dome to the nozzle exit plane.

Basic composition of the glass fiber-reinforced case—designed by Hercules and designated Spectraflex—is approximately 90% glass filament and about 10% epoxy resin. Case strength is provided by winding the glass in as to part the filaments in pure tension. The resin protects the filaments and binds them to impart some shear strength, but the winding pattern is such that it keeps their strength at a minimum.

Case doesn't actually have an elliptical configuration to cover that the nozzle section is spherical when the case is pressurized. The ports permit an aluminum ring on the center of the dome is trapped by the winding pattern.

Thickness in the cylindrical portion of the case is constant, then in the knuckle area where dome meets the cylinder, and built up in the cone portion of the dome.

The glass-fiber-reinforced cases are supplied by a vendor, Black, Scullis and Brown, Ashmore, Utah, and by the Hercules plant at Rock Hill, S. C. Later this year, case for solid rocket production of Air Force Plant 51 will be supplied by Hercules from Cleveland, Utah, as a major supplier and parts by Black, Scullis and Brown. Both Hercules at Rock Hill and Black, Scullis and Brown will supply Spectraflex cases for Minuteman Wing 2 research and development motors as a backup source for Air Force Plant 51 production.

Preparation for case winding of the center starts with a gasket mandrel built on a shaft to an assumed case geometry of the case shape, and includes four axial ports also in rings and four perpendicular chambers

holes for thrust termination ports. Third stage is the only Minuteman stage incorporating provisions for thrust termination. From this assumed configuration, the mandrel is modified to account size and shape.

Next material (the) rubber is applied in sections to the gasket mandrel and hand fitted to the mandrel contour. Thickness of the rubber varies in accordance with the temperature rise to be encountered on the motor during motor burning. Case is about 1/8 in. at forward end and approximately 1/4 in. at the aft or nozzle end of the case. This internal insulation for the case is used to bond the various sections then is fastened to conform to thickness tolerance limits.

The glass filament is fed from a spool, passes through an epoxy bath, packing up in concentric spirals of the resin, which is squeezed off. Two arms moving back and forth apply the glass filament to the rotating mandrel to wind domes integrally with the cylindrical sections in a helical cross pattern. Winding is thicker at the aft end, but average thickness over the case is less than 1/8 in.

During the process, laminated glass fiber fabric is installed over the thrust termination ports and over the nozzle



REMOVAL OF CORE SET from Hercules third stage motor results into (arrows) left by wing cone is solid propellant. These dots with center dot, from the initial burning zone. Ductility control techniques (right), shows nozzle alignment with propellant nozzles.

ports and wound into the case pattern to become integral with it.

Core sheets which serve as interstage connections, are obtained by placing steel mandrels on the center shaft at both ends and wrapping the mandrels integrally with the case, with a fiber dome incorporated and extending from the end of the shaft about down to the steel shaft.

The fiber domes are reinforced off up to the cylindrical portion of the shaft and the steel mandrels are pulled by a hydraulic jack. This leaves a shell of about 5 in. at the aft end and about 8 in. at the forward end.

Nozzle ports and thrust termination ports, which had been completely con-

structed during the winding process, are opened by boring and the edges are hand finished.

This phase winding is broken out of the case and removed through the nozzle and thrust termination ports. This completes the case reinforcing process and the case is shipped to the Hercules/Brown Works for preparation and loading.

Initially, cases are inspected, hydrostatically tested, then shipped to Arrowhead Tooling, Los Angeles, for application of chamfers during rings at the end of the shaft. This ring is bonded to the shaft with an epoxy resin and holes are drilled in the ring, which serves as plates for reception of test



ring nozzles. Arrowhead also installs the operational nozzles, which curves extracts from the graduate section to steel and nozzle activation. Later in the program for Air Force Plant 51 production, the inspection and hydrostatic testing and installation of mating rings and nozzles will be accomplished at Cleveland, Utah, where both Hercules and Arrowhead will be operating facilities.

With the case returned to Hercules, a rubber boot is installed in the aft dome to insulate it for heat resistance. A shrinkage boot is bonded to the boot only where the dome meets the cylindrical section and is loose in the rest of the boot, but held on glass with



THIRD STAGE MOTOR with interior body cone of case is loaded with about 55 lb of propellant powder (fine grain) and rotated and filled in mg (left) to produce powder subchamber lines. Spigot (or) is aligned (right), on subchamber burning nozzle.



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double-lined marking tape. The shrinkage foam, like the insulation foam, has grooves for the nozzle blast tubes and the center spacer post, which was opened by removal of the plates immediately after the shrinkage foam was bonded to the propellant grain and it then in post discharge, the foam will follow the grain and the void created will later be filled with polyurethane potting compound.

Liner

In the case forward dome, only a shrinkage foam is bonded to the internal insulation where the cleave occurs the cylindrical section, serving the most purpose as the air discharge duct. A carbon sheet is bonded to the forward shock age layer at the rim of the hole left by the nozzle shaft, for access to pass the propellant.

Each of the four thrust termination ports is drilled on the inside with a rubber flap to protect the phenolic air base from action of the nitroglycerine curing solvent.

One then goes to the New facility where a 24 inch diameter is used to check for voids between the Specifier case and the rubber insulation.

Four thrust termination nozzles are installed next, to conduct currents to the ports for initiation of blowdown.

The case, fitted with a harness and supported on a dolly, is transported to look left to the external insulation and where Lear's specially developed material, Avicel, is applied in an automatic trimming operation. The case is supported horizontally and rotated.

Curing thickness is approximately 5 in. thick, but increases to about 1 in. in some areas at the aft end.

Propellant

The Class 3 automatic propellant is manufactured using a double-line composite process. Powder is made up of 92.74 by 9.274 right cylinder consisting of a constituent which theodolite will not identify, plus nitrocellulose nitroglycerine aluminum powder the additional explosive and burning rate control, aluminum perchlorate oxidizer, a plasticizer (trimethyl), and a gellant (nitrocellulose). Nitroglycerine also is used in the curing solvent.

First step in the propellant loading process is preparation for powder combination. The case is wrapped horizontally on a rotating dolly and then is rotated around with epoxy resin, known as the laminar coat because it seals the rubber insulation against the curing solvent. The resin is cured in an oven and the case released is sprayed again to deposit a second coat, which is cured in a tacky condition.

The case is then placed on a dolly

which can be both rotated and tilted to cover the inside with a uniform layer of base grain, which is poured through the rubber sheet in 15 lb batches until about 75 lb is poured.

Case is put in a handling harness and the case (overdred) act. Manual consists of a center core and four wing cases and is positioned inside the case by working through the center (grain) post and blast tubes, where they are released by wing rings. All cases taper toward the forward end of the case and the wing cases lock into grooves in the center core, which extends into the case to a point about 15 in. from the forward dome. Case

each thickness at the center core opening also will be about 15 in. and core diameter there will be approximately 5 in.

This case configuration is used at achieving a neutral burning pattern.

Case is transported to the operating building, placed vertically in a pot, with forward end up. Vacuum is pulled on the thrust termination post flaps to ensure they are tight against the thrust termination rollers in the vacuum holds, it indicates there is no leak around the flaps. The powder layer is placed over the loading bracket in a loading adapter and personnel leave the building. Two strikers loads around

Nanocircuit of the Month



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the core are stored to ensure a solid pack, and powder is fed in.

First loading level surface is about three-quarters in. Most loading is a narrow band of different compositions powder to produce faster burning for compatibility with the core composition. Last level of powder is hand-loaded, to the top of the loading mold. Vacuum is pulled on the core as the confiner for about 25 lb., to remove moisture and volatile gases from the base grain. With vacuum held the air-cut line, which was attached to the slaps before the vacuum was pulled, is in the nitrilous solvent, which includes additives to speed jelling of the base grain to achieve a solid propellant. Case is filled with solvent to the top and some solvent is drawn off during the filling process to ensure good contact of the grain.

The filled case, now a motor, is removed from the jet after being at the air in bottom end have been changed and, with the motor casing up in the vertical position, now solvent is forced through the line attached to the cutting adapter and one of the holes at the bottom of the motor, in double assurance that saturation is complete. Motor is left this way for about 45 hr.

With hoses removed, motor is taken to the case bay and a pressure test is set in place of the cutting adapter. Compressed air at 125F is applied for about 16 days, producing a solid propellant grain. Cool-down period is about five days.

The recent release of grain protruding up into the ribbed case is cut off the motor (removed left and right) and case is pulled through the motor part and the four motor parts. Recapped jetting is performed at the air end, the motor inserted with forward end up and potting compound injected in all the space on top of the ribbed case. In that case, a pressure chamber closer disk is attached to the motor forward case opening.

Rotation requires longer firing, now up vertically for lengths of 100 mm, and the motor is tested 45-day for autocatalytic burning. Targeted burning also is done. A total of 90 motors are made.

In final assembly, all electrical wiring is checked. A flow subunit rotation is bonded to the outside of the air dome to protect the Spentlon case against the heat induced by the motor at altitude. Thrust transducer is attached to complete. Nozzle is installed, optically aligned and pitch, yaw, and roll travel is checked.

Nozzle case is a high-pressure, high temperature welding. An exhaust case and composite liner has a silica-phosphate outside throat and a resin impregnated graphite cloth for the nozzle surface. The silica phenolic liner has a low rate

of heat conduction, and the graphite cloth has a high conduction rate. Coarse models of the nozzle, which are lighter, have a Spentlon wrapping on the outside to provide an increase in nozzle strength.

Nozzle exit plane diameter is about 15 in. The nozzle throat diameter is estimated to be approximately 34 in., resulting in a contraction ratio of about 18 to 1. Thrust insert is tungsten backed by graphite. An insulating air tunnel behind the graphite protects the moving part of the nozzle. Nozzle is double control with a government furnished case, as supplied by North American Aviation's Astorics Division.

Igniter is installed in the aft end of the motor. Equipped with a spring and strong device, the Huthers-designed unit is activated by spring pellets which in turn initiate the burning of a small cut grain to start case grain ignition. Switch to activate the thrust transducer device is mounted on the forward case and motor is weighed and its center of gravity determined. Scraping air for drag is 1 out of 18 production units.

The shipment to the Boeing assembly line in Air Force Plant 77, Hill AFB, Ogden, Utah, the motor is installed in a special Boeing designed harness similar to those used on first and second stages, so that the stages can be mated accurately in perfect alignment.

Complete integration of production from Hercules' Boebling Works to the new Hercules-operated Air Force Plant 81 should be accomplished by the end of the year. Staff will include about 1,000 people in the state of about five conventional types for one inclined type. Facing Plant 81 production, the Boebling Works will conduct research and development on Wing 7 Minuteman third stage also serve as a backup production plant and offer support in handling autographs and in preparation of silvex. It will also perform static testing for motor acceptance by the Air Force.

Support Structures

Bids for constructing approximately 55 airframe works of various support structures at three T-2 sites are being accepted by the U.S. Army Corps of Engineers, Ballistic Missile Construction Office, Los Angeles. To be built are 20 hard RF (high frequency) antenna structures and 16 hard VHF (very high frequency) antennas constructed at each site—Davis Mountain AFB, Fresno, Ariz.; McClellan AFB, Wickenburg, Ariz.; and Little Rock AFB, Little Rock, Ark. Drawings and specifications are available from the District Engineer, U.S. Army, V. Postmaster, Davis MTS, 5 Eugene St., Los Angeles 12, Calif.

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Thrust Reversers Blamed in DC-8 Crash

landing roll at Stapleton Airfield, Denver, Col. Now, at the 121 compass was already seized as an immediate result of the impact; however, there were 18 passenger fatalities as a result of carbon monoxide poisoning when the aircraft stalled. On

Subsequent to this accident, extensive modifications to the DC-4 technique were made mandatory as an Airworthiness Directive issued by the Federal Aviation Agency. Another Airworthiness Directive required that all DC-4 aircraft be equipped with a traffic alert device needed to prevent unintentional application of asymmetrical thrust.

The board determines the probable cause of the accident was the asymmetric thrust which during a high-speed emergency, resulted from the failure of the thrust reversers on engines Nos. 1 and 2 when severe thrust was selected. A combination factor

was the failure of the first officer to consider the third reverse indicator lights when up above ocean level.

After several flight preparations were completed, steep clearance was received and the engines were started. The aircraft was pushed back from the loading dock by a tug and the flight taxed out for takeoff, which was at 1012.

The experts who had been flying the aircraft manually (used the controls bar) in the last affairs (said) he and the second officer evaluated the situation. After consulting the aircraft and operating manuals and a UAE training bulletin they decided they had no alternative (other than to) continue landing in this situation. The captain and he therefore elected to continue to Denver but if he had thought of this as an emergency situation he would have returned to Chicago to take advantage of the longer runway at that airport.

The crew and the sensor stewardship is the final class and lowest workers were involved in the situation and were told the work would be performed if the things in conditions were in adequate time for the crew to prepare for the situation which might be necessary.

During this time the flight was continuing to divert the crew contacted the company supervisor and decreased the altitude. An

The second officer calculated their expected landing weight, measuring speed, approach speed and threshold speed for normal flap and no flap conditions. In addition, he informed the captain of the maximum engine pressure ratio data for gear and engine.

As the light progressed toward the Strasburg intersection, the captain and two officers concluded to monitor the situation and advise the patrolmen to be followed during the landing. As a further precaution, after turning around onto Drexel, the light returned permission to hold at 15 000 ft at Strasburg in order to clear out the hydraulic system in preparation for landing.

The crew then tried to extend the 100-ton² by hitting the automatic brakes three back. This was unsuccessful even when they increased speed from about 150 to 240 ft. This urban accident by the crew was of no value because the system is designed to prevent by mechanical means (instead of the system under development) loads. After reducing speed again they turned on the auxiliary hydraulic pump. Pressure built up to 7000 psi, slack line lights indicated the system had extended properly, and the brakeless final quantity of the increased tension.

The capsule then rolled to 15 deg of flaps. The flap control was placed in the 15 deg detent and the flaps extended. At the same time the detent control indicator light came on and three tones out indicating that the wing slats were open and locked. The hydraulic pressure gauge indicated 3,000 psi, and the counter increased one unit. After completing the approach circuit checklist, the crew reported clearance to the airport. The clearance was approved and the captain took over the controls as the aircraft departed. Stronach issued the out-

^a Missing through reverse assembly.

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See [eventful page](#)

Flight 338 originated in Philadelphia on July 11, 1961, and proceeded uneventfully to Chicago. Capt. John Gross, First Officer Arthur J. Feltz, and Second Officer (Flight Engineer) James M. Beane, took over the flight crew duties for the remainder of the trip to Omaha and Des Moines. Normal preflight preparations were completed at Chicago and the flight to Omaha was successful.

4) *Quacha*, the snout was severed to a head of 70-800 lb. at best. The girth was

* All times given are Mountain Standard Time based on the 1985 clock.

ACCIDENTS PASSENGER FATALITIES AND SURVIVORS BY AIRCRAFT TYPE
SCHEDULED SERVICES — 1940 AND 1941

TYPE OF AIRCRAFT	INCIDENTS					
	Fatal Passenger Accidents		Passenger Deaths		Passengers Surviving	
	1960-1969	1970-1979	1960-1969	1970-1979	1960-1969	1970-1979
Jet	5	6	113	234	18	106
Turboprop (100-1000)	7	6	345	182	12	54
Propeller powered 12000+	23	10	469	347	193	49
	357	22	818	764	324	249

* Fatality rates figures
 † Includes 1 fatal accident between a jet and a propeller powered aircraft, counted as 3 accidents for the purpose

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MS or equivalent in AE or EE with 5 to 10 years experience in military equipment and flight testing. Responsibilities include the review and analysis of model specifications for use planes with program requirements.

stick. The flip handle was then placed in the 25-day detent. At this time, the electric power was factored again and then left in the 25-day detent. The quality engineer indicated that it was possible to flip the handle to the 25-day detent. The second officer immediately called for the flip handle to be removed to the 15-day detent and turned off the electric power. The second officer was then decided at this time that the hydraulic fluid level was just below the safety window of the safety pump supply line.

Gear Lowers

It was then decided to allow the gear to turn full, and the was done. The gear was then lowered gear indicator lights came on only after the gear was down and locked. At this time there was some hydraulic pressure and the operator requested assistance. The hydraulic system operator stated that the gear was in position No. 1 and the system was to be held for 25 days. The second officer was then told that the flip handle was put in the 25-day detent and the flip indicator was 25 days. The captain then had decided to run system 25, so as to avoid flying in the city and because he could make a better approach to the field. After the final check was completed, Capt. Gorman called for 40 days and 40 days of the flip was obtained. He announced to the passengers a normal landing run expected and this should not be ahead of the other vehicles which they would be waiting. The captain kept the approach speed at approximately 155 kt, so as to be prepared for a no fly landing in the event that zero decision track should lose the flip to or turn toward their intended position. After reaching 150 ft from the threshold he reduced speed and held for 25 days of the flip. The handle was put in that detent and the flip indicator was 25 days. The aircraft crossed the runway threshold at a speed of 121 kt and a normal touchdown was made at about 125 ft. It was later determined from the flight recorder data that touchdown was about 155 ft from the threshold.

Thrust Reversed

The crew stated that their normal procedure after touchdown was to place all four engine levers into the idle position without constant concern to touchdown of the new gear. When the first officer hit the gear on the runway, and on the captain's command, he would apply reverse power to engines Nos. 2 and 3 and then to Nos. 1 and 4 which could be used either manually or automatically. This was in addition to the normal run the procedure followed.

The crew stated that controlling was a bit after was having gear touchdown. The power lever was brought to the idle to reverse position and all four engine reverse lights came on. The first officer said that the reverse lever had been applied reverse power to Nos. 2 and 3 engines and the reverse gear power lever No. 1 and 4. He left the aircraft back to the right, looked at the runway and set the

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¹ The first officer immediately stated that the gear was not set and the second officer indicated that the gear was not set and the second officer indicated that the gear was not set.

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approximately 30 mm in long, the 30, 4000 rpm. The engine had old as a control path in the right off the motor, across a gear strip, let the steel edge of a spring-controlled cam drive timing, and had come in 1971 on the timing about 4-912 ft from the threshold of entry 204 and 400 ft to the right of its centerline. The marks on the runway were clearly visible as were the tracks when the springing gear strip. It could be seen that the marks of the aircraft even the ground moved from a scratch in a self-healing leading while the aircraft heading changed from approximately 350 to 600 deg separate.

Tire Tracks

All four tires on the right main landing gear were blown off. The tire marks made by these tires were visible, continuously curving off the runway to the right and across the grass outside to the point where the gear failed and appeared from the air. The marks left on the runway by the left main landing gear tires were intermittent and were not discernible as the aircraft curved off the runway and across the grass outside. Three of the two blow out during the shot and the fourth, the forward outboard, was replaced by a spring with the runway along the left gear had failed and appeared from the aircraft. The tracks left by the most gear were identified as the runway and over the grass to the point where the gear failed and appeared from the engine. A "forward track" in the right of the gear track through the grass directly was determined to have been made by the No. 4 engine nozzle.

Engine Damage

The No. 4 engine was torn from its pylon at the lower firewall. The engine and nozzle were found under the forward fuselage compartment and had sustained severe fire damage in addition to the impact damage. The low pressure (N1) compressor blades had struck damage on evidence of rotational damage. The high pressure (N2) compressor had extensive blade and shroud damage from the 125 to the 144 stage. Severe damage was noted to all turbine wheels. All turbine vanes broken but no evidence of aerodynamic conditions was found. The main support on one engine was torn from the engine. The thrust reverser was separated from its actuator and the thrust reverser buckets were in the forward thrust position. The thrust bucket selector valve, with operating data 1974, however it was possible to determine that it was in the reverse thrust position. The lower portion of the pylon was consumed by ground fire except for the engine actuator and its steel and titanium fittings. The engine support was fully extended. All damage to the engine appeared to be the result of impact and fire.

The No. 2 engine, which separated from the aircraft, appeared to have been in the forward portion of the fuselage and came to rest about 40 ft to the right of the runway. The engine sustained light to moderate fire damage, but severe impact damage. Rotational damage to the No. 2 engine was moderate with damage confined to the fuel and

second stages of the compressor. The No. 3 compressor was intact and undamaged and would be rotated freely. All blades of the turbine wheel assembly were broken and bent opposite to the direction of rotation, however there was no indication of over-temperature or excessive damage. The main support was separated from the engine and severely damaged by impact. The thrust reverser, which also separated from the aircraft, and the thrust bucket selector valve were found in the open or forward thrust position. All damage appeared to be the result of impact and/or fire.

Engine No. 1 was twisted around on its pylon, and the structural attachments failed by impact. There was no fire damage and only light impact damage to the

engine. The No. 1 and No. 2 compressors were intact and rotated freely. All turbine wheels and blades were also intact and the wheels could be rotated freely. The thrust reverser was separated from the aircraft. The thrust bucket selector valve was found in the forward thrust. All accessories were intact and appeared to have been lightly damaged from impact.

The No. 3 engine was located about 175 ft to the right of the aircraft. It had sustained light to moderate impact damage but no fire damage. The first stage of the No. 3 compressor had no bearing damage and gearbox blades and main interference between the 1 and 2 wheel portions. The No. 3 engine was intact and could be rotated. The turbine wheel assembly



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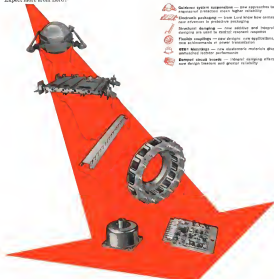
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were upset with an air compressor; and others. The most expensive was cracked into the turbine exhaust case. The third engine, which had sustained light damage, cracked from the exhaust and was fixed all of the right way. The three engine failures were in the forward third position and the third basic section tube was also positioned for forward thrust. All other things appeared to have worked fine in fact.

No evidence was found in any of the four engines to indicate any excessive failure of bearings, gas inlet accessories or accessory drives.

The cockpit power lever positions in total at the wing were No 1—slightly off reverse able to reverse direction; No 2—full forward thrust; No 3—forward idle position; reverse full down and No 4—idle reverse.

The fuel shutoff levers were off, except No 3, which was one inch from the off position.

Fire Damage

The extensive fire after impact destroyed a major portion of the left wing and left side of the fuselage from the cockpit area aft to the rear passenger loading door. In addition, the entire inside of the cabin was gutted. The fuselage was aft of the wing emergency landing door was crushed inward due to contact with a runway's paved track parked 300 ft from the runway.

In addition, the base of the impact destroyed the lower frame of the landing door and crushed the exit accessible from the aisle.

It was determined that the landing gear was down and locked prior to separation from the runway. It was also determined that the main landing gear doors were open at impact. The flap screens were extended approximately to 50 deg and the flap slots were open. The right spoiler on both wings were in the retracted position. The left right spoiler on the right wing was also retracted, however the left wing on right spoiler actuating cylinder piston was fully extended corresponding to the spoiler extended position.

Wing Damage

Both left and right wings were still attached to the fuselage; however, the left wing was severely damaged in fact. There was more low velocity cracks or gouges on the lower skins and internally low density or bubble. The bottom of the ribs were not required anymore since they were in fact. The damage prevented the remaining fuel in the affected tank to drain into the ground.

Flap damage on the right wing was confined to the trailing edge and flap. The emergency was intact and the control was being maintained.

Because of the nature of the impact, a major difficulty encountered by the flight director was concentrated in the outer brakeable system. All engine lines and nozzles were disconnected in the same manner than they slipped to the HNL flap screen and Orchard fire in San Francisco fire destroyed only the left burner.

The hydraulic recovery was found intact. On disassembly it was found that the left

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of the ground he had left a mark on the ends of the resistor to such a manner that it was possible to determine the height of liquid in the tank at the time of the first application. This mark represented a quantity of 5.17 gal. In addition, the quantity gauge, first grossly miscalibrated, the same type of marking indicating it was half miscalibrated in itself. It was found that data was not necessary of this that was not returned by miscalibration with a better gauge due to insufficient diameter. As a result, a decrease in the hydraulic fluid quantity would not be reflected on the quantity indicator if the height exceeds a value.

The No. 1 and 4 engine control valves were pulled in the actual position. The No. 2 engine control valve was not found.

Wheel Brakes

All wheel brakes and associated components were examined for evidence of malfunctions. No lining was found to indicate mechanical difficulty. Brake chambers were without generated leaks. Hydraulic actuators only had control and service controls were in an operable condition except the damage caused by operation of the landing gear from the aircraft.

The torque link upper ball of the left had no gear assembly and the upper portion of the landing strut piston were broken. Three links were examined and found to have been covered by impact factors. There was no evidence of fatigue, corrosion damage, or defective material. The main right landing gear was separated from the airplane. The torque link on this assembly was intact. The hinge lock mechanism on both main gear were undamaged and their wires, as the landing position.

The gear and strut were torn from the aircraft. The right nose struts externally was bent. The left nose struts externally had separated from the air at the fuselage connection. Hydraulic lines to both main gear were intact between the gland valves and cylinders. The nose strut struts and valve and other check valve mechanism and wire intact.

Other Systems

All other systems of the aircraft were examined. Although extensive damage occurred during landing and fire, no malfunctions were found to indicate malfunction of any of the systems. Fire damage to the No. 2 expansion tank hydraulic pump rendered it inoperative and it could not be tested. The No. 3 pump was found to be undamaged and operated without abnormal leaks during functional bench test. In the field test, at 10,000 ft, within the pump produced a pressure of 150 psi, and a rate of flow of 100 gallons per minute.

During the investigation the possibility of events associated during was considered. To demonstrate this condition, a simulated loss of engine pressure was a factor of the scheduled strapping with automatic check valve was applied. In this test with the torque link disconnected gauges had disconnected at the control valve, control valve unseated, and scheduled strapping as available is changed. There was no movement of the strapping valve. With left rubber pedal movement the valve related to the right and with right rubber pedal movement the

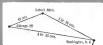


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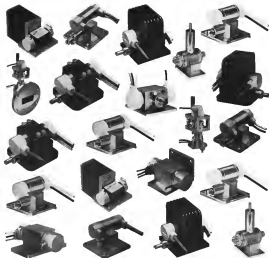
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collar rotated to the left, releasing a re-entrant spring condition.

Two tests were then conducted at 90 and 115 ft. In these tests a minimum delay occurred at the noseback of two of these devices appears to the rubber movement was noted. However, in all cases delayed control of the engine was easily maintained with backup or solder. It was subsequently determined that in any event, the valve connector shock valve from N 3040U was capable of normal operation.

Causes of Death

An extensive investigation of the crash site and emergency evacuation aspects of this incident was conducted. It was learned from the witnesses and from the pathological study of the bodies that the dedication of the engine was not excessively high and that no apparent traumatic injuries were sustained by the crew or passengers at the crash itself. Factors of the descent were found at the landing after the fire was brought under control. Three fatalities resulted from carbon monoxide poisoning. One passenger, an 87-year-old woman, broke both of her ankles during the experience of the engine and subsequently died in the hospital as a result of shock. The other fatality was an individual who was part of the ground crew force on the airport when the engine hit the road track during its ground slide.

The crew members opened the forward left main emergency door and the aft right entry door, while passengers opened both of the emergency exits on the right side of the cabin. Though there were 106 of the passengers evacuated the airplane. All of the 95 first class passengers, three flight crew members and two crewmembers evacuated through the forward left-hand door in through the emergency exits. Sixty-two of the 75 passengers of the tourist section evacuated the airplane utilizing the two door exits and the aft overwing exit on the right side. The entire evacuation was completed by the door teams throughout the cabin.

The Denver weather at 11:40 has maximum after the accident was forecasted 6.0 to 6.5 inches, 18,000 footless high, maximum visibility 80 mi., temperature 71°; dewpoint 68°; wind southwesterly 7 mi., altitude 10,000 ft.

Analysis and Conclusions

The hydraulic system of the DC-8 consists of many component parts, including valves, actuators, hoses, and emergency of taking running throughout the aircraft. The track and low density material in N 3040U was obvious that it was responsible to discontinue where the failure occurred which resulted in the metal loss of hydraulic fluid.

As to the state of the leak, it is not able to eliminate various systems which were either reduced by the crew or was not utilized as normal flight.

The powered hydraulic and rubber system were released and the horizontal stabilizer was system was not used. The time which system was isolated by the control valve being closed. The power brake valve isolated the hydraulic brake system. When the aerial hydraulic pump was operated, the fuel line contained, therefore the fuel pressure was not so used of these systems. In addition, one may check valves in the hydraulic sys-

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from normally prevent any pump pressure from entering the engine-driven pump hydrostatic lines. Thus it can be seen that the hydrostatic test unit is in these lines or in the engine-driven hydraulic pump.

The system which could not be isolated were the large line, the landing gear to track, the engine control valve and actuator, the selected spooler service, the wing flap up the wing door closed, and the nose landing gear door actuator on the closed side. Any one or more of these could have been the source of the loss of fluid because they received hydraulic pressure from the ground system any time it was available.

Fluid Quantity

Following the initial loss of fluid, the crew reported that the hydraulic quantity indicator was about 1 inch from the bottom of the gauge. The hydraulic system holds 19 gal of fluid but the maximum fluid level which the flow transmitter in the tank will sense is 5.5 gal. The quantity gauge did prevent two months of use of 17.5 gal, with a "low" and "normal" segment. The low end representing the 5.5 gal level and the high end representing the 19 gal level. A change of one gallon of fluid either above this level would be reflected in 17.5 gal of some most of the quantity indicating scale.

When the crew detected this, action to change segments in the indicated fluid quantity level already about 9 gal of fluid would be isolated from the reservoir. Also when the landing gear was allowed to fill, about 1.6 gal of fluid would have been

added to the reservoir, yet no increase was registered on the quantity gauge. From these indications it appears that the hydrostatic fluid level must have been below the lowest level measurable by the flow transmitter.

It also appears that the inability to get 25-psi of flow was because the fluid level at that time was below the inlet couplings supplying fluid to the auxiliary hydraulic pump inlet.

The procedures followed by the crew to get past this "no-flow" condition were the approved procedures based on the information available at that time during the flight. The shift to the No. 3 position of the hydraulic system selector was proper and necessary to center pressure flow locations during the approach. In this position there was no pressure available in the ground hydraulic system which prevented, among others, the ground spooler, control valve steering and the engine. Hydraulic leakage was available from the fuel accumulator.

The system was in fact extended and continued to during the approach as indicated by the flow stick like lights of the quantity indicating system. The evidence available to the flight indicator that after touchdown the three engine buckets on the left side of the airplane did not enter to the closed position. As stated before, one principle faulted the system and stated that the buckets did not close. These buckets must be closed to direct engine thrust as a forward thrust. They are connected in a common which is directed to the bucket to connect a pressure fluid coupling when the engine is fully extended. This

planned coupling consists of a master on the engine piston and a slave valve mounted on the engine which mate and compress about 1 inch for complete coupling when the engine mechanism returns to the full up position. If an engine does not extend fully or if it should move forward at such as 1 inch, all fluid coupling will not be engaged and the thrust vector bucket will not close.

Engine Operation

Normally the engines are operated by the throttle. There is also an emergency provision for extending the engine by use of the air bottle valve. This system was not used. Thus the two methods are essentially equal with emergency action going beyond extended for hydraulic fluid under emergency conditions. Each engine mechanism has a control valve which gates system pressure to act on extending cylinder in closed or extend the cylinder. Each control valve incorporates two emergency stopper plunger type valves which are, when actuated, electrically to either extend or retract. These valves are linked gear to serve to operate with 5000 psi applied and the linkage rate after a three-minute venting time, to be within specific limits. During this test, linkage is gated at low pressure and decreases in higher pressure and to act the proper valve more quickly. For this reason, following loss of engine pressure, the existing linkage will permit internal leakage to the other line, any internal leakage of an engine control valve, under these conditions has the same effect on the adjacent system. This is be-



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some both optical control valves, on one side of the aircraft are supplied by a common pressure line which incorporates two opening and one check valve. One check valve permits the backflow of fluid pressure and the other permits high pressure air to be introduced as an alternate method of optical operation. Air delays to return the one way check valve or the optical control valves will delay the hydraulic lock feature which is designed to hold the system in the closed position where system pressure is lost and prevent backflow on the same side of the aircraft to move forward from stalled status.

These four control pressure in the system return lines, aerodynamic loads and the forward shifting tendency upon touch down and during rollout.

Ejector Lights

From one testimony it appears that the ejector lights for the optical warning system were so sturdy, enduring all 40000 hours extended, until the aircraft was on the way. At the time of breakdown on the way, the second officer reported seeing ejector lights flashing indicating one or more ejection seats in danger.

A representative of the aircraft manufacturer denied that at high altitude the aerodynamic loads acting on the ejector seat in the air stream. He also said that at 10000 ft above 100 ft in the approach configuration these aerodynamic loads would be negligible.

Based on all the foregoing information the Board believes that the ejector seat on 10000 ft and 2000 ft above rollout after touchdown and prior to the positioning of the power levers in the abort mode that it was believed that the ejection of the seat movement was so slight as to be inaudible to the passenger observing, but sufficient to disengage the pneumatic fluid coupling. As a result, when the crew pulled the power levers for reverse thrust the thrust reverser levers were not closed. The closed reverser Nos. 1 and 2 to the forward thrust which were Nos. 3 and 4 were producing reverse thrust during prior application.

Reorder Timings

There is also extended evidence of abnormal timing during the landing. The flight recorder time contained several indications in indicated altitude beginning about 10 seconds after touchdown. Examination of many other altitude records made during normal landings of DC-8s disclosed no records of similar disturbance, however an extended review of the altitude traces of two DC-8s landings in which asymmetric reversing or several indicated altitude abnormality of indicated altitude. These landings in which F.M. Flight 581 at Miami, Fla. on July 11, 1968, and DAL Flight 855 at Chicago, Ill. on June 14, 1968.

The rapidly increasing indicated altitude while the engine is at constant altitude already results from the transients in the indicated altitude of the static ports during asymmetric reversing. On the DC-8 the cross pressure fluctuation in the static pressure is.

In order to understand clearly the sequence of events which took place during this landing, a comprehensive review was



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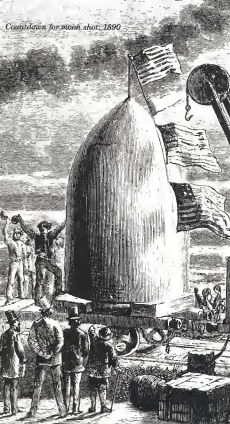
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*In Vidor's 1990 novel, *From the Earth to the Moon*, "the spaceship 'Columbia' was launched from Titus, Florida—just 50 miles from Cape Canaveral. After missing the moon, the craft splashed to earth as it fell 260 miles to sea. It glowed like the ice, popped in the darkness—and the three men inside were found 'playing at childhood'."

Business Analysis

made following flight recorder data for 642 males, and new statements. This was conducted in two phases: static and dynamic.

This test phase was initiated by relating the subjects' flight recorder loading data to the path indicated by the ground survey. The ground survey was used to determine potential sources of information were good, the groundpath was judged to be a suitable base for the analysis. The aircraft loading data was then plotted against the ground path from which signs for acceleration along the aircraft's axis of gravity were obtained (thus, this analysis combined the two virtual axes). The act passing moment was computed by plotting a plot of act rising moment versus time. It was possible to identify the time of the act passing moment of occurrence of the applied raising, as moments acting during this loading. An examination of this plot revealed that in three cases, the act passing moment at the time of raising, time might raise moment at three and developed to a maximum value of 250, 000 foot-pounds in approximately six sec.

Between zero and eight seconds a near left turning moment developed to a value of 400 000 ft/lb, but was of insufficient duration to arrest the right turn to any appreciable degree.

Assumptions Used

The above study considered as conjunction with even statements led to the following assumptions which were used as the making computer study

- If touchdown: an evidence of focus to the task developed
- Riddle control and semantic linking was applied on words after touchdown
- Anonymouse linking was applied about 2.5 sec. after touchdowns

- A large, unobscuring wing moment developed after 5 to 10 sec from touchdown forcing the aircraft to the right and off the runway.
- Roll due to yaw created a right winglow attitude of about 5 deg., approximately 11 sec after touchdown.

The initial phase in diagnosis points of the analysis was then conducted utilizing an analog computer to compare the information derived from the static analyses with a variety of loading conditions which were possible due to the accident. The information for these simulated loading conditions was obtained from engine monitoring and flight test data. These simulated conditions in all hydraulic combinations included the effects of forward and reverse thrust situations, rudder and aileron failure, spoiler, commitment braking, and in flight engine restart.

- All four engines were at or near idle for most of the touchdowns
- All four power levers were placed in their cruise/idle detents 2.4 to 8 sec. after touchdown

- The forest revenues for regions Nos. 1 and 2 are negligible
- Maximum revenues forest was ordered

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corresponding incidents move from the center toward periphery.

The board determines the probable cause of the accident was the asymmetric thrust which during hydrostatic emergency, resulted from the failure of the thrust reversers on engines Nos. 3 and 4 when reverse thrust was selected. A contributing factor was the failure of the last effort to monitor the thrust reverser indicator lights when applying reverse thrust.

By the Civil Aeronautics Board:
Alan S. Boyd, Chairman
Robert T. Wendt, Vice-Chairman
Chas. Gurnea, Member
G. Joseph Smith, Member
Whitney Gilfield, Member

Investigation and Hearing

The Civil Aeronautics Board was notified of the accident shortly after it occurred. An investigation was initiated in accordance with Section 702(a)(2) of the Federal Aviation Act of 1958. A public hearing was held in Denver, Col., Sept. 20, 21, 23, 25, 27 and 29, 1960.

United Air Lines, Inc. holds a carefully selected committee of public convenience and necessity issued by the Civil Aeronautics Board and is an active operating certificate issued by the Federal Aviation Agency. These national operations cover a number of routes including the one here involved.

Flight Personnel

Capt. John Green was employed Nov. 1, 1948, and promoted to captain Feb. 16, 1949. He had a total of 17,071 flying hours, of which 10,100 were in the DC-8. He holds a recently effective airline transport pilot certificate with a type rating in the DC-8. His last flight was a physical examination on Jan. 17, 1961.

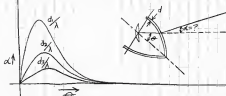
Mr. Arthur F. Pitt was employed by United Air Lines Aug. 15, 1950, as a flight engineer. He qualified Jan. 16, 1951 as a first officer and was promoted to captain Sept. 25, 1959. He had a total of 5,879 flying hours, of which 328 were in the DC-8. He holds a currently effective airline transport pilot certificate with type ratings in the CV-440, CV-440 and CV-440, and the DC-8 and DC-7. His last test after FAA physical examination was Jan. 15, 1961.

Mr. James M. Bates was employed Sept. 11, 1948, as an apprentice co-pilot. He became a first officer July 24, 1956, and was promoted to a first officer Jan. 23, 1959. He had a total of 5,416 flying hours, of which 245 were in the DC-8. He holds a commercial pilot certificate and instructor's rating as well as a flight engineer's certificate. His latest successful physical examination was Jan. 11, 1960.

All four accidents had substantially passed the current ground training course in emergency procedures.

N 5049U was manufactured June 18, 1961, and had accumulated a total of 124 hr, 19 min up to July 15, 1961. No major electrical failure had been reported since the completion of one stop-July 15, 1961, when the engine No. 5. This time was caused as desired. The propellers were stalled on the aircraft were Pitt & Whitney (Pitt & Whitney) and all had accumulated 124 hr, 19 min, except No. 1, which had a total of 499 hr, 31 min.

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IBM asks basic questions in memory

What is the fastest way to remember?



This is one of eight 2"x7" subunits in a new experimental memory containing 515 bits of information per square inch, the densest packaging ever reported for thin magnetic films.



The switching speed of this experimental thin-film drive (above) is being increased by using a polarized light beam which rotates each tiny direction of magnetization changes.

Computing speed is accelerating constantly. But before computers can process data, they must pass it through main storage. Unless ways are found to transfer more information in less time from main storage to central processing units, the time required to obtain stored data will limit the speed of the computer.

To shorten access time, IBM is developing advanced memories. Recently, two scientists fabricated a magnetic thin-film memory which completes a full read-write cycle in 100 nanoseconds. They also have put to use a technique for measuring switching times in the nanosecond range with polarized light. Experiments with this technique revealed that a multi-layer-bit thin-film "sandwich" switched ten times faster than an equivalent single-layer-bit device.

More immediate gains in access time can be obtained through new developments in ferrite core technology. By reducing the core size from 30 thousandths of an inch to 30 thousandths of an inch in outside diameter, new engineers have created a 17 million bit magnetic core memory with a cycle time of only 2 nanoseconds. A device which contributed greatly to this development, a lead-doping matrix switch, was also instrumental in the creation of a 74,000 bit "sandwich pad" ferrite core memory capable of a read-write cycle time of less than 700 nanoseconds. This matrix

switch makes it possible for the switching-power load to be shared by several drivers at once, thus reducing the total power requirements.

The efficiency of computing systems can be increased by improving the design of thin memory structures as well as through the development of new computer systems. IBM engineers are developing nondestructive read-out techniques which can reduce the number of machine operations required in thin-film and ferrite core memories. They have formulated addressing systems in which machine-word lengths vary according to the natural lengths of the bits of information being stored. They have devised innovative memory techniques which retrieve information on the basis of related data rather than specified addresses. Out of several developments like these, which reduce machine references to memory and simplify programming, may come the memory systems of the future.

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For assignments related to reliability theory, test planning, data evaluation, instrument errors, error analysis and high speed electronic calculations. Requires degree in Mathematics with strong educational background in the sciences, or ME or AE, with background in statistics and probability theory, particularly as applied to engineering, and testing in liquid propellant rocket engine and propulsion systems.

ELECTRONIC SYSTEMS

To analyze and conduct research that relate and experimental investigations for the synthesis and analysis of advanced electronic control systems such as traffic control, target location, visual signaling and feedback controls. Minimum 5 years related experience.

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For propulsion and performance analysis for all breathing engine systems, including propellers, ducted fans and ducted propeller systems. Requires advanced degree with 3 years experience in internal combustion and propulsion analysis.

MERIT ENGINEERING

For development of complete guidance and navigation systems for strategic and tactical missions in cruise and zero speed vehicles and sub-marine navigation, and drone recovery. Varies degree levels with 2 to 8 years specific experience in one of the following service design and analysis: trajectory development, low frequency design and development involving servos, systems and component testing, receiver characteristics, accelerometer integration, inertial instrument development.

STRUCTURAL ENGINEERING

To develop structural concepts for high temperatures and space structures including and direct test programs, prepare research proposals. BS with 8 years in stress analysis and structural design, including high temperature structures and associated thermal materials.

SYSTEMS INTEGRATION

BS in ME, Applied Math, AE or Physics, with experience in the dynamics of closed loop systems, guidance, navigation of vehicle flight, space mechanics, analog and digital computing systems.

ROCKET PRELIMINARY DESIGN

To conduct analytical and design studies and investigations in all areas of rocket engine and rocket systems, including conceptual design and support analysis for new rocket propulsion systems. Requires BS or advanced degree in ME, AE, CHE or Applied Physics with minimum 6 years experience in thermodynamic and fluid dynamics, or heat transfer as applied to liquid propellant rocket engines.

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Fallacious Arguments

Mr. Chapman, in his letter to *AVIATION WEEK*, Aug. 6 (p. 134), listed three ways of detecting losses in commercial space. I would like to share how rich of three those ways are fallacious.

1. Level machine sales of insurance to medical research.

Why purchase an insurance contract for a hypothetical accident? After all, more or less accidents are the result of some sort of mechanical failure or acts of God than "mad lunatics."

2. Vide in agreement and publication that if a gross loss in space occurred, less money than our company, all profits are lost.

Soundly like something a moon would try to pull. Why the concentration on one area? I haven't seen an insurance policy out of a bank yet.

3. Investigate all purchases of large amounts of insurance.

Yes, do this and you'll find that the accident is quite able to pay for previous-risk search.

Results are explained are caused by the recently detailed business practices taught by these people in an all-inclusive and in no way added into the domain of self-insurance. The recently detailed no dividend will denote himself, if he is aware, whether or not he has insurance practices. Therefore, let us get away from being preoccupied with the matter of insurance and admit a genuine solution to the problems of exploration in space. Forget all language, hand held and paper covered print in the business efforts do when our return and learn the results. After all, is not the loss of a human being more precious than any material thing brought into or out of a country? (Darryl J. Anderson, Thompson, Phoenix Douglas Aircraft Santa Monica, Calif.)

Management Change

The following comment should have been made a long time ago. Company policies and other uncertainties have deterred a space which I now choose to give my best. I must ask that neither my name nor my address be mentioned in connection with these comments.

The loss as an inevitable result of failure in both the lunar and interplanetary programs poses some question as to the competence of the management of the branch of the concerned space programs. We have had evidence of only attempts by the Air Force (there were previous and nearly constant and said, were more failures e.g., loss of the Altair-Aldrin class of command extended to collect the moon, loss of Ranger space craft-two wasted in interplanetary investigations of the planets) around the moon and two additional failures in would be rough lunar landings, and currently the Mariner moon (AW July 30, p. 11).

Isn't it true that we became preoccupied with the fact that close to \$100 million has been expended with not a single success

Aviation Week addresses the opinions of its readers on the issues raised in the magazine's editorial columns. Address letters to the Editor, Aviation Week, 330 W. 42nd St., New York 36, N.Y. Try to keep letters under 500 words and give a proper identification. We will not print anonymous letters, but names of writers will be published on request.

Don't we give away of the "but we have something from every failure" category of mistake. Ground space exploration of exploration but have we become so puffed in our economic appetite that \$100 million of losses comes in opened space history in Congressional terms? For how much longer will we get nothing for our money and effort? How do we attach so consistently successful results in the Mercury program and such a lack of results in the lunar and interplanetary programs? If the current space program is in danger as information obtained from the lunar and other planetary programs are addressed will our

op in collection of the information that should have provided data explains.

We have five suggestions to make:
1. For all losses—especially the Altair—to be used for these critical losses and more planetary exploration, the quality control of the entire lunar vehicle (all parts) must be of the level of that used in the Mercury program. (Presently this is not so.)
2. The great task to be conducted should be supported by substantial patients and control of experiments (included in the period that do not necessarily directly in the same task should be withheld until then as in which we shall reap success in the lunar mission. In particular, all costs we refer to the Ranger mission, we land the lunar capsule into a 1000 V planet last dispatching the weight now given to all other experiments to back up either one of these program trials.

After such failures, management of the lunar and interplanetary programs needs to be changed quite completely—now! (Name withheld by request)



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